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The Birds and Mammals of the Creston Region

British Columbia

by
J. A. Munro

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THE BIRDS AND MAMMALS OF THE CRESTON REGION,

BRITISH COLUMBIA

By

J. A. Munro

Issued--August, 1950.

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THE BIRDS AND MAMMALS
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CRESTON REGION, BRITISH COLUMBIA

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J. A. Munro

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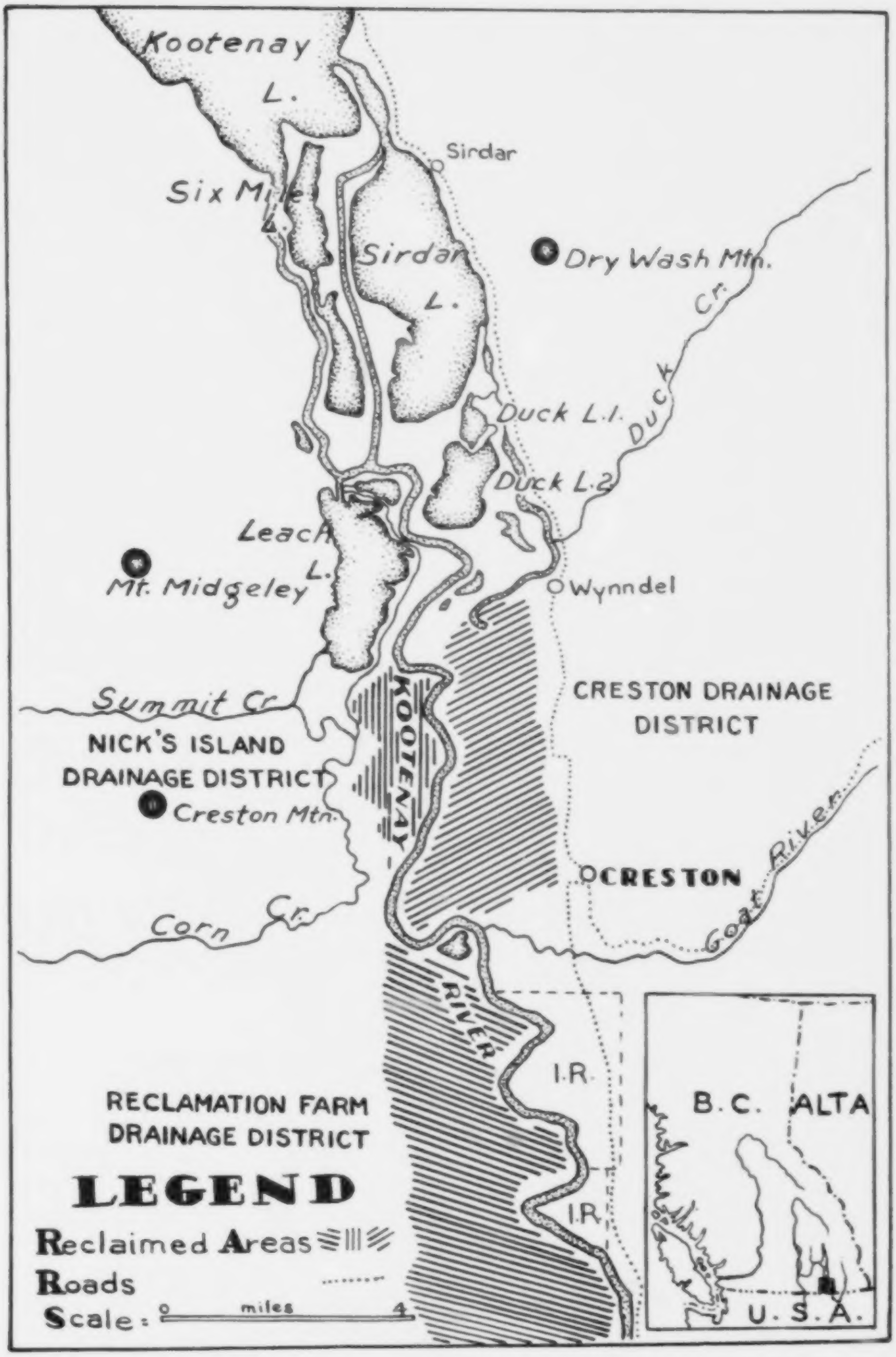
Kootenay L.
Sirdar
Six Mile L.
Sirdar L.
Dry Wash Mtn.
Duck Cr.
Duck L.1.
Duck L.2
Leach L.
Mt. Midgeley
Wynndel
Summit Cr.
KOOTENAY
CRESTON DRAINAGE DISTRICT
NICK'S ISLAND DRAINAGE DISTRICT
Creston Mtn.
CRESTON
Goat River
Corn Cr.
RIVER
I.R.
I.R.
B.C.
ALTA
U.S.A.
RECLAMATION FARM DRAINAGE DISTRICT
LEGEND
Reclaimed Areas
Roads
Scale: 0 miles 4

Fig. 1. Map of Creston Region, British Columbia.

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The Birds and Mammals of the Creston Region, British Columbia

J. A. Munro

Errata

Page 4, line 31. Read "Fig. 7" for "Fig. 6."

Page 18, last line. Add "of the Dry Forest, with giant cedar and mountain white pine characteristic species"

Page 19, line 32. Read "comprising" for "comparing" ing"

Page 26, line 3 from bottom. Read "Flying" for "lying"

Page 40, line 5. Read "stooped" for stopped"

line 14. Read "stoop" for "swoop"

Page 41, line 3. Read "windrow" for window"

Page 45, line 23 and elsewhere. Read "Haliplus" for "Haliptus"

Page 54, line 19. Read "intergradation" for "intergraduation"

Page 74, line 28. Read "American" for "Amercian"

The Birds and Mammals of the Creston Region, British Columbia

by

J. A. Munro

INTRODUCTION

The Creston region of British Columbia, more particularly that part of it known as the Kootenay Flats, has been subject to profound environmental modification during the past 20 years. Undoubtedly modification will continue. The purpose of this paper is to record the primitive characteristics of the region while remnants of them still are available for study, to note the current, but rapidly changing, scene, and to discuss the bird and mammal populations as observed in 1947, 1948, and 1949. In the first year the periods May 12-23, August 1-September 18, November 12-13, in the second year the periods May 6-24, July 24-September 25, and in the third year the periods August 18-23, August 31-September 5, were directed toward this endeavour. The territory studied includes the valley of the Kootenay River between the International Boundary and the south shore of Kootenay Lake, the mountain slopes and the cultivated benches adjacent to the town of Creston and the settlements of Wynndel and Sirdar, the region on the west side of the valley known as West Creston, and Boundary Lake in a high mountain valley west of the Kootenay River and close to the International Boundary (see Map, Fig. 1).

THE KOOTENAY FLATS

The Kootenay River, rising in the Rocky Mountains of British Columbia, flows south through the Rocky Mountain Trench into the State of Montana, then, after turning west into the Idaho Panhandle, swings north through the Purcell Trench of the Selkirk Mountains to enter British Columbia again and to discharge its waters into Kootenay Lake.

In a remote past Kootenay Lake extended south to a point near the present site of Bonner's Ferry, Idaho. During succeeding ages the Kootenay Flats were built up by sedimentary deposits from the Kootenay River and its tributaries so that, at the present time, the south shore of Kootenay Lake is 40 miles north of Bonner's Ferry.

Between these north and south boundaries, and shut in on the east and west by the foothills of mountain ranges that rise abruptly from the plain, are the 120 square miles of territory known as the Kootenay Flats. The lowest elevation of the plain in British Columbia is approximately 1,736 feet above sea level. Under primitive conditions, now greatly modified, this was the flood plain of the Kootenay River. Through this plain the river cut deep channels, and formed banks that yearly were added to by flood detritus, in places becoming permanent with cottonwoods, willows, and dogwoods growing on them. At other places were ever-shifting channels through which the spring freshets flooded the entire plain. As the floods subsided a residue of water remained in the depressions and these constituted the lakes, ponds, and marshes of the valley bottom.

The fertility of this alluvial flat soon became apparent to settlers and even so early as the last decade of the nineteenth century attempts to reclaim portions of it by dyking were made. From 1921 onward these attempts were successful. At present some 52,500 acres, of which 17,500 are in Canada, have been reclaimed.

There remains on the Canadian side approximately 20,000 acres of flood plain in its primitive condition. Most of this acreage is included within the extreme northern part of the valley, that is to say, the portion of the Kootenay Flats immediately south of Kootenay Lake. The river here, for a distance of six miles, flows through two channels that in places are two miles apart. A lesser portion is included within the Indian Reserve situated between the International Boundary and the town of Creston--a nearly level plain containing numerous round-stem bulrush marshes and sedge meadows where the soft soil is thick with moss (Fig. 2). On

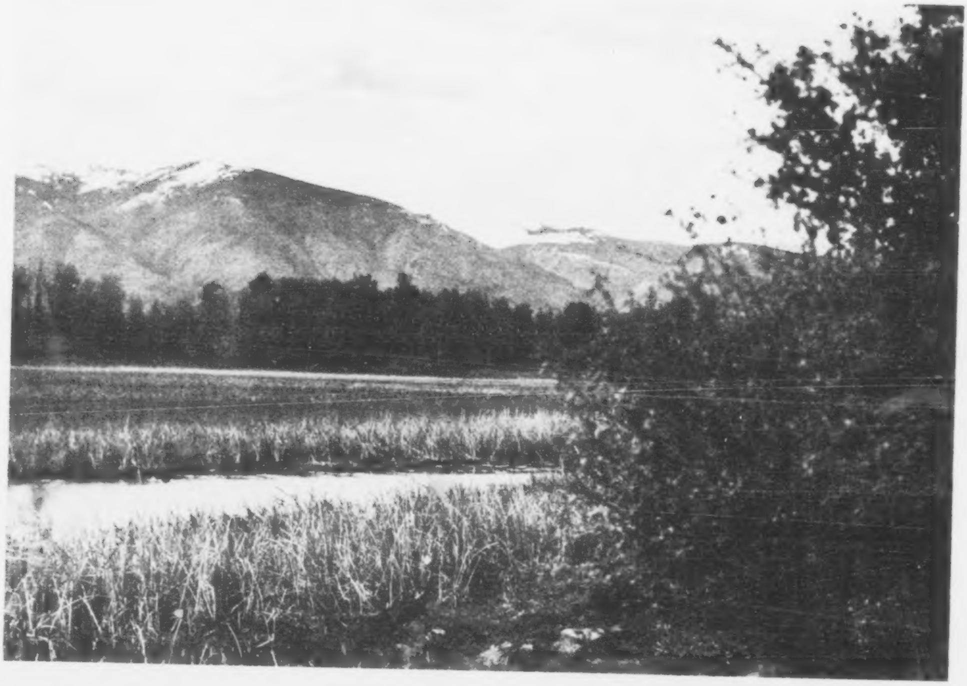

Fig. 2. Bulrush marsh on Indian Reserve south of Creston.

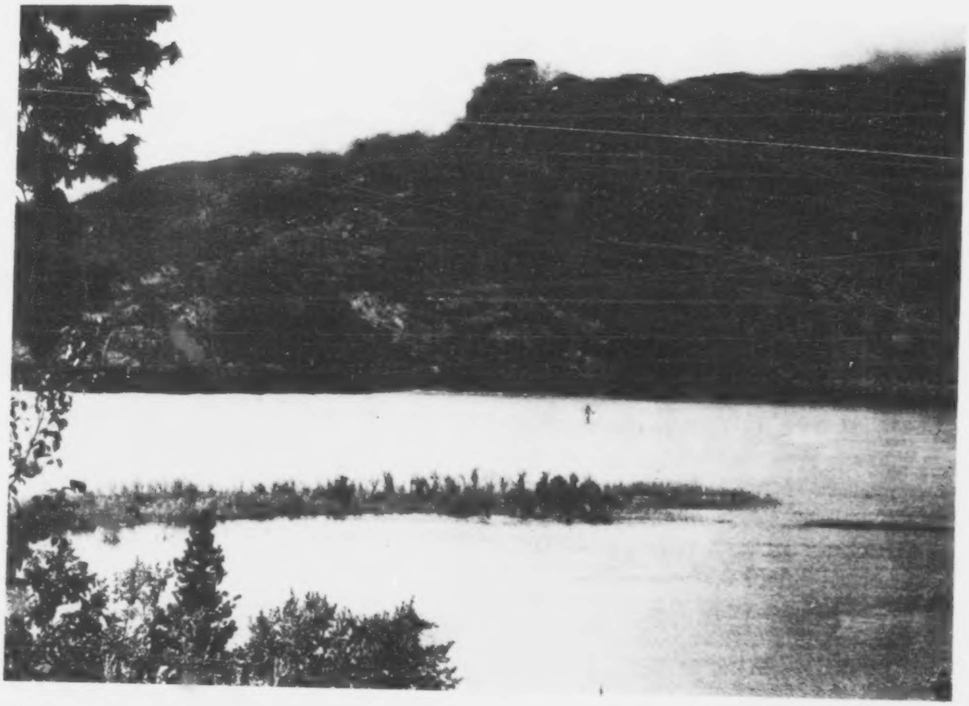

Fig. 3. Kootenay Flats during the spring flood.

slightly higher ground are groves of tall black cottonwoods (*Populus tricocarpa*), and the river margin in places is marked by a wide belt of these tall trees.

Sirdar Lake occupies the greater part of the plain lying east of the east channel of the river and into this channel the lake drains. During flood stages Kootenay Lake backs through the outlet to raise the level of the lake and flood all the adjacent plain. West of the river similar flood conditions prevail at the same time.

As viewed during the spring freshet, from high ground to the east, the entire area is a continuous sheet of water, flooding the shrubbery and trees along the mountain base and extending westward to where a wall of tall cottonwoods that mark the course of the Kootenay River shut off further view of the plain in that direction (Fig. 3). Here and there are islands of flooded willows, and at one place a single black cottonwood marks the position of the submerged south shore. The shores of the lake have disappeared; the courses of creeks and channels can be identified only by the half-submerged trees that mark their banks.

The same aspect in August, after the floods have subsided, presents a quite different appearance (Fig. 4). Sirdar Lake is seen to have definite beaches of hard silt, and inland from them are margins of green vegetation. Immediately to the south, and draining to Sirdar Lake, are now revealed two smaller lakes. These last together are known locally as Duck Lake. To the south again, but in the distance, are two isolated sloughs. Winding through the flat to the east of the small lakes is Duck Creek Channel draining to Sirdar Lake (Fig. 5).

The land portions of the flat are covered with a lush vegetation in which greens predominate. Here are the emerald green of horse-tail, the lettuce-green of arrowhead and cattail margining lake edge and stream channel, while green of a more sombre hue marks an occasional bed of round-stem bulrush. Ribbons of sage-green identify thickets of sandspit willow; sedges and grasses add still other shades of green. The fabric is green, but woven into its pattern is a design of yellow, orange, blue, violet, and white provided by the associated flowering plants.

Plants characteristic of the primitive flats are: water parsnip (*Sium cicutaefolium*); hedge nettle (*Stachys palustris*); loosestrife (*Steironema ciliatum*); sneezeweed (*Helenium autumnale*); forget-me-not (*Myosotis laxa*); burr marigold (*Bidens cernua*); false dragon-head (*Physostegia parviflora*); Indian hemp (*Apocynum cannabinum var. hypericifolium*); *Tanacetum vulgare*; bitter cress (*Cardamine pennsylvanica*); and an artemisia (*Artemisia ludoviciana*).

The ponds, sloughs, channels, and beaches also are rich in flowering plants. One of the most notable is water marigold (*Megalodonta Beckii*) that grows in great masses in several of the lakes and, less plentifully, in one of the channels (Fig. 6). Hitherto this species has not been recorded in Canada west of Saskatchewan (A. E. Porsild, in litt.). Another species new to British Columbia is *Downingia laeta* Green, otherwise known in Canada only from Crane Lake, Saskatchewan (8).

Other flowering aquatic plants of which specimens were collected are: *Ranunculus aquatilis* var. *capillaceus* (Thiull) D. C.; *Ranunculus Flammula* var. *reptans* Mey; *Radicula nasturtium-aquaticum* (L.) B. and R.; *Saggitaria latifolia* Willd.; *Saggittaria cuneata* Sheldon; *Alisma Plantago-aquatica* L.; *Allocarya Scouleri* (D.C.) Greene; *Veronica peregrina* L. and *Callitriche palustris* L.

Again, in early September, the appearance of the flats alters. Each year at this time the West Kootenay Light and Power Company closes the gates at Bonnington Falls Dam so that the water level of Kootenay Lake rises--to back into the plain at Sirdar Lake, and at Leach Lake to the west, to cover the lake beaches, deepen channels, and flood the horsetail marshes. The boundaries of the smaller lakes are then much extended. Thus minimum water levels prevail between the time the ice melts in March or early April and the arrival of the spring flood in late May or early June.

West of the river the flood plain extends to the bases of the abrupt slopes of Creston Mountain and Mount Midgeley. Here also are a number of sloughs and shallow lakes. Two mountain-born streams, Corn Creek and Summit Creek, after following several miles of wandering courses across the plain, combine their main channels and flow north to empty into the Kootenay River. These waters are described in detail in the following paragraphs.

Sirdar Lake is approximately 4 1/2 miles by 1 3/4 miles (Fig. 6). The bottom is hard silt with some intrusions of sand, notably where Duck Creek enters and at the lake's outlet, viz.; a short channel into the east branch of the Kootenay River. In August, the outer margins of the lake bottom were exposed, forming beaches of varying widths, and on the west side a wide-based peninsula terminated in two long, bare, sand spits. This configuration, invisible at flood time, was again considerably modified by the high water in September as has been stated. Over a greater portion of the lake the maximum August depth was 10 to 18 inches; close inshore the depth was much less, too shallow to float a canoe. This shallow condition prevailed over much of the large bay lying south of the peninsula referred to earlier. In the northern third of the lake, well out from shore, the water deepens to six feet or more, and a small area of still deeper water is reported. But here also are extensive inshore shallows. Horsetail (*Equisetum* sp.) is the dominant emergent growth and forms extensive shore marshes that dry out in early August and become inundated

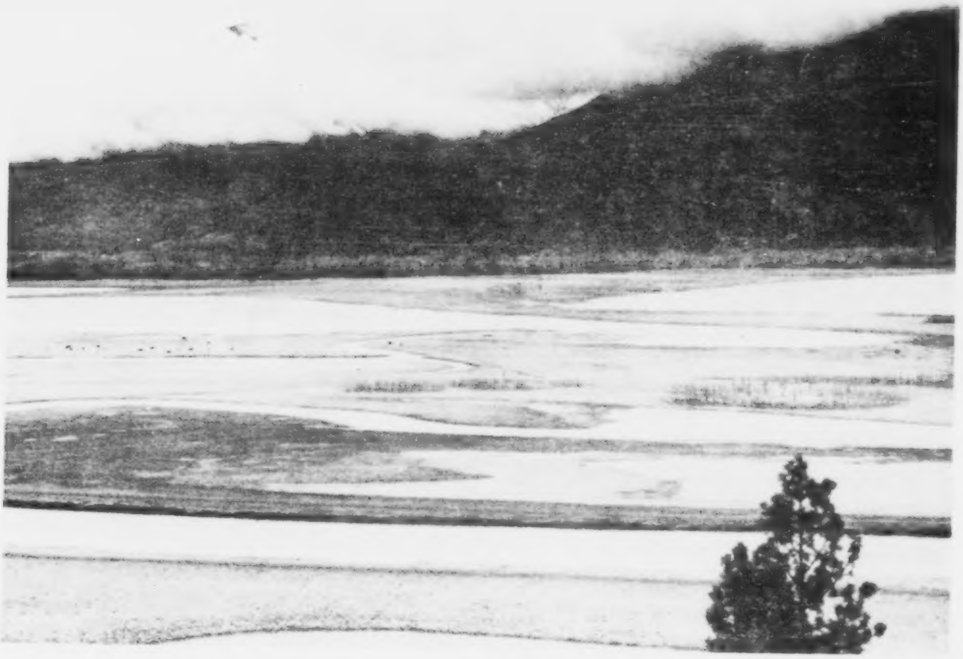

Fig. 4. Kootenay Flats after flood waters had subsided.

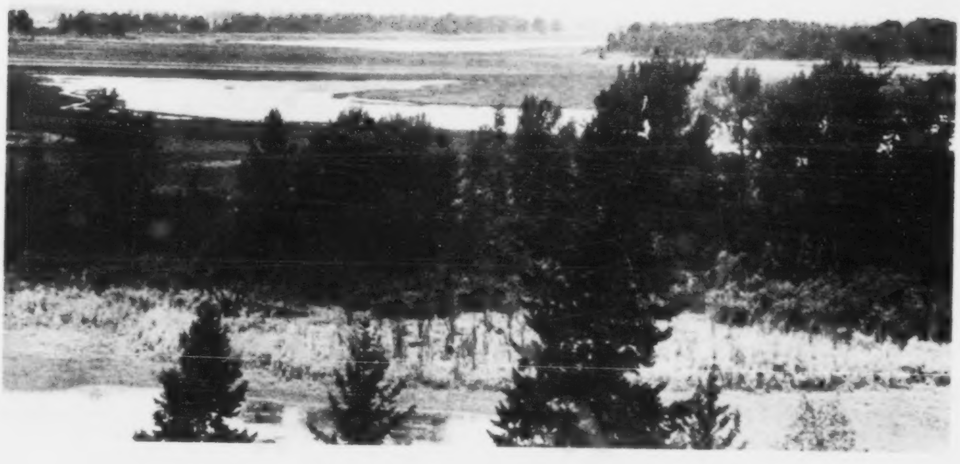

Fig. 5. Two sloughs and Duck Creek Channel on Kootenay Flats.

again in early September. At the south end of the lake, on the otherwise treeless flat, are several thickets of sandspit willow (Salix fluviatilis Nutt.) and three solitary black cottonwoods of small size, conspicuous in their isolation.

Submerged aquatics are abundant, more so in depths of twelve inches to three feet than elsewhere, although no portion of the lake bottom seems without plants of some kind. As viewed from the mountain side in August the lake appeared to contain many islands of fruiting plants, some of these islands being several acres in extent and visible from a long distance. Close examination of the plant masses revealed an aggregation of species in which one or another of them was dominant. Thus in one Anacharis canadensis in another Potamogeton pectinatus or P. pusillus was the chief constituent. Still other masses were composed of those already named in company with Ceratophyllum demersum, Myriophyllum spicatum, and Potamogeton zosteriformis. In some, long flower stems of Ranunculus penetrated through the mass and the surface was whitened with their blossoms. Between these extensive beds of plants the bottom was covered with Chara, with Nitella, or both. On the exposed lake bottom constituting the beaches in August is a varied flora including water smartweed (Polygonum amphibium), water starwort (Callitriche palustris), wapato (Saggitaria latifolia) and great quantities of needle rush (Eleocharis acicularis inundata).

On August 13, when a complete circuit of the lake was made by canoe, it was observed that a surface foliation of aquatic plants was continuous over all areas up to five feet in depth except in the shallows along the west shore where only a sparse growth of Chara, Nitella, Potamogetons, and, in some places, needle rush, was established. The water was clear over the weed beds and not infested by filamentous algae as are so many lakes in August, but near the north end of the lake, in deeper portions, it was clouded in varying degrees by silt held in suspension.

In early September, 1947, following a strong wind from the southwest, a windrow of vegetation piled up on the sand-spit that extends out from the lake. This flotsam was composed of the ripe seeds of Potamogeton pusillus together with needle rush, other fine vegetable debris and enormous numbers of minute gastropods and caddis larvae cases. The spit is a favourite resting place for pond ducks and undoubtedly such wind-blown food is important to them.

In 1947 flood conditions had subsided by mid-July and by August 1 the waters were clear, aquatic vegetation was luxuriant and wide beaches margined much of the Sirdar Lake shore.

The exceptionally high flood of 1948 was responsible for a condition substantially different from that of the previous year. On June 7, 1948, the levees on the Reclamation broke at several places so that approximately two-thirds of these lands were inundated and continued so for several months. Not until early September did the last of the flood waters disappear.

In the interval Sirdar Lake, into which some of the floodwater from the reclaimed lands drained, or was pumped, maintained a relatively high level and kept submerged the beaches that were so conspicuous a feature of the lake's topography in August, 1947. The waters continued murky from the inflow of the silt-heavy discharge off the ploughed lands. The growth of submerged aquatics was delayed so that little surface foliation had appeared in early August.

In comparing the contrasting conditions that prevailed in these two years yet another difference was apparent. In 1947, the sturdy, clean growth of pondweeds and other submerged flora is Sirdar Lake and its tributary waters was cause for frequent comment, whereas in 1948, practically all the aquatic plants were enveloped in algae.

In 1948 the waters again were clear and the aquatic vegetation free of algae.

Duck Creek and Goat River Channel. Since the course of the Goat River was diverted to the Kootenay River twelve years ago the old channel across the Kootenay Flats has become a weed-grown and stagnant slough, except that part of it extending north from the dyke at Wynndel to Sirdar Lake, a distance of approximately three miles, which is refreshed annually by flood-water (Fig. 8). The banks along the upper two miles of the channel carry large cottonwoods and other deciduous growth. Beyond, near where the waters of Duck Creek enter, the channel is divided for about a half-mile or so to form a narrow island which is heavily wooded. For the remainder of the distance to Sirdar Lake the course is plainly visible across the nearly treeless plain. Here five- to six-foot banks contain the waters along the west side of the channel, but on the lower, east side there is recurrent flooding of the horsetail marshes that define the channel margin there (Fig. 9). On the relatively high ground to the west are the characteristic haylands of sedges, grasses, and forbs.

The bottom is composed of hard silt with sand deposits and some rock in places. The cool waters, both in shallow reaches and deep pools, are extremely rich in plant life. Probably the most abundant species is Potamogeton natans, the surface leaves of which cover large areas Seed heads of this plant, prominent in

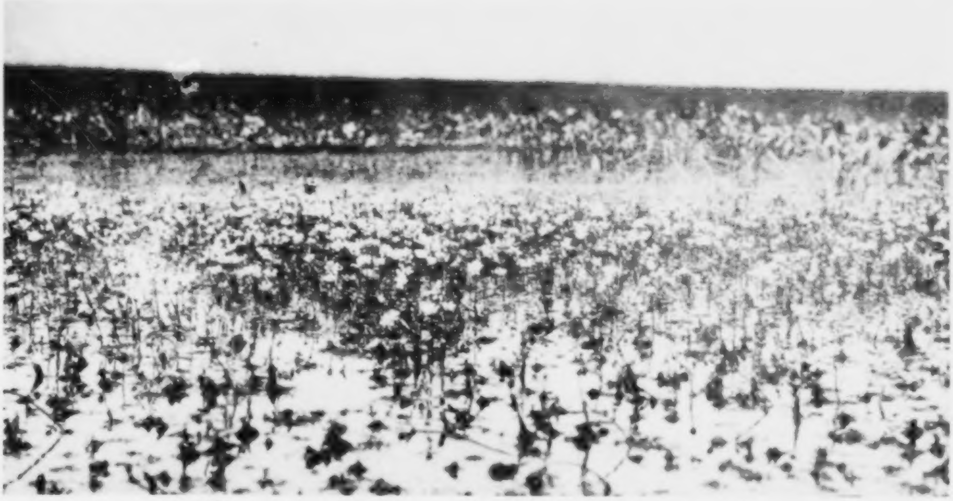

Fig. 6. Water marigold at Duck Lake 2.

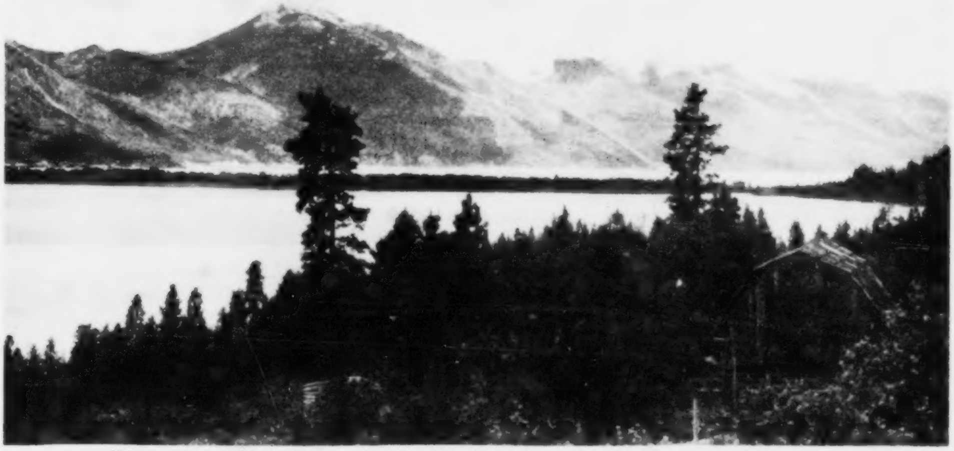

Fig. 7. North end of Sirdar Lake and south end of Kootenay Lake.

Fig. 8. Goat River Channel.

August, measured 40-50 millimetres in length. Next in importance is Potamogeton pectinatus, and this species, too, carried a heavy seed crop. Other important elements in the bottom flora are: Potamogeton foliosus, P. zosteriformis, P. americanus, P. amplifolius, P. Richardsonii, P. pusillus, Ranunculus sp., Myriophyllum spicatum, and, in shallow places, Anarcharis canadensis. As in Sirdar Lake, so here, these plants formed dense mats with one or another of them dominant. In deep pools the vegetation was not massed and long stems of Potamogeton Richardsonii and P. zosteriformis slanted upward to the surface. Some places, where the creek encroached upon low ground along the east side, were white with the bloom of water buttercup, others were covered with the yellow blossoms of water marigold. Large beds of wapato against a background of horsetail reach in unbroken abundance far out into the shallow waters on either side of the channel entering Sirdar Lake (Fig. 10).

A mile or so above Sirdar Lake a branch of the creek, narrower and more shallow, leads to Duck Lake 1. For a quarter-mile or so above the main channel it follows the base of a relatively high ridge on which grow sand-spit willows and a few cottonwoods. For the rest of the distance it is contained within low banks. The bottom is hard, the vegetation similar to that of the main channel, but with the inclusion of some Potamogeton epihydrus and P. gramineus.

Duck Lake 1. This is a slough of approximately 300 acres with maximum depth (August 6, 1947) of 19 inches (Fig. 11). The outer circumference of the surrounding marsh is marked by an unbroken stand of horsetail. Inside this marsh is a belt of tall arrowhead and some water plantain (Alisma plantage aquatica). This condition prevails at all points except along the south shore where a narrow beach of hard silt is exposed. Above this on a low ridge that separates this lake from Duck Lake 2, horsetail is replaced by grasses, sedges, and flowering plants. Around the entire lake, out from the hard beach and the horsetail-wapato marsh, is a band, 50 to 75 yards wide, of dense vegetation composed of Potamogeton pectinatus, P. Richardsonii, P. zosteriformis, Anacharis canadensis, and lesser amounts of Myriophyllum spicatum, and of a white-flowered Ranunculus. Here also are numerous beds of water marigold, Chara and Nitella. The central portion of the lake is dominated by an almost clear growth of Potamogeton Robbinsii.

Duck Lake 2. This slough is an enlarged version of Duck Lake 1, with exactly the same disposition of aquatics, viz.; (1) horsetail marsh fronted by a belt of arrowhead, (2) a wide belt of Potamogetons and other plants, and (3) over the greater part a continuous bed of Potamogeton Robbinsii. Near the north end are patches of bur reed (Sparganium sp.), and, a quarter-mile across the flat to the west is a small cattail marsh. The two sloughs are connected by a winding channel that in August was covered with the surface leaves of Potamogeton natans.

The two much smaller sloughs, referred to earlier, situated to the south and to the east, respectively, are similar in all essentials to Duck Lakes 1 and 2.

Mud Lake is an open sedge meadow of approximately 100 acres situated just outside the Nick's Island dyke that forms its east and south boundaries. Along the dyke are cottonwoods, willows, dogwoods, and other deciduous growth. Open water in the centre of the meadow is margined by yellow pond lily (Nuphar sp.), not found elsewhere on the flats, and about half the distance from the dyke to open water a patch of round-stem bulrush (Scirpus acutus) is conspicuous among the sedges (Fig. 12). The lake drains through a narrow channel to Summit Creek.

Leach Lake. The east shore of Leach Lake is separated from the main channel of Summit Creek, into which it drains, by a narrow and relatively high ridge of meadowland. The west shore for the greater part of its length is along the rocky base of Mount Midgeley. Along the south end is a wide rush, grass and sedge meadow. The lake is shallow throughout (48 inches maximum depth in mid-August, 1947) and particularly so in the southeast portion where a short creek from the main channel of Summit Creek enters. Here the bottom is sandy and open beaches of sand and silt extend into the lake on either side of the entering channel (Fig. 14). Two other channels of Summit Creek cut through the plain to the west and enter the lake near its southwest corner. These have bottoms of sand and fine gravel. Around the south end of the lake, between the east and the west channels of Summit Creek, are wide, hard beaches extending outward from the sedge meadows. These extensive beaches are covered with vegetation of one kind or another; in places the diminutive needle rush paints a green mist on the clay-coloured silt; in other places water smartweed or arrowhead is dominant. In early September, along the inner edge of the beach where it meets the sedge, the delicate blossoms of the rare plant Downingia laeta (Greene) covered several hundred square yards with blue sheets of bloom.

There is no emergent growth in the lake. Potamogeton Richardsonii, distributed over most of the lake bottom, is the most abundant pondweed. Elsewhere P. pusillus, in association with P. zosteriformis and water buttercup, is the most conspicuous species.

It will be understood that this description refers to conditions as observed in August and early September. Later the beaches

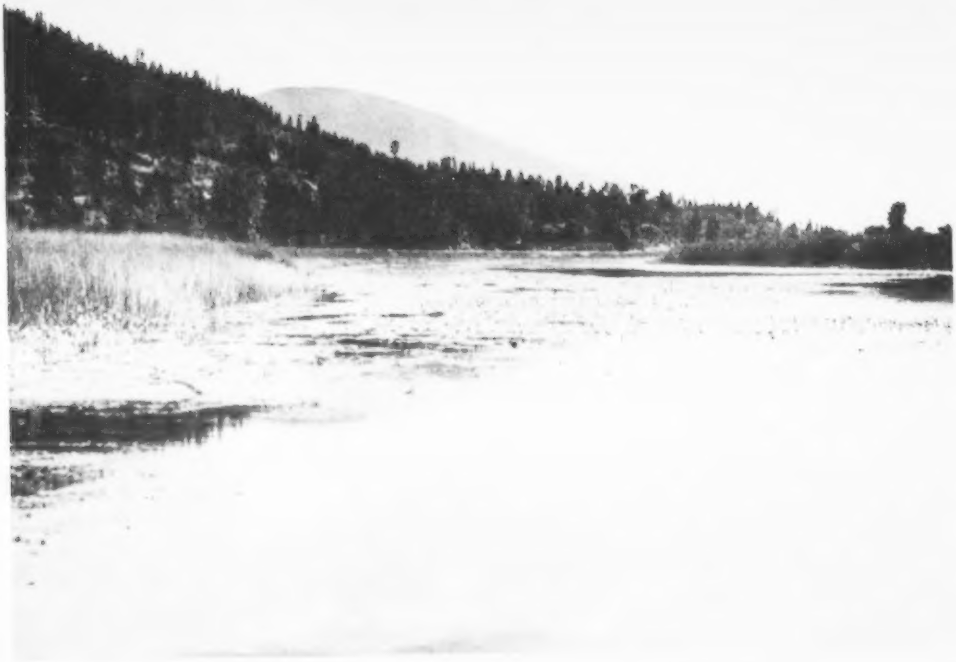

Fig. 9. Duck Creek Channel.

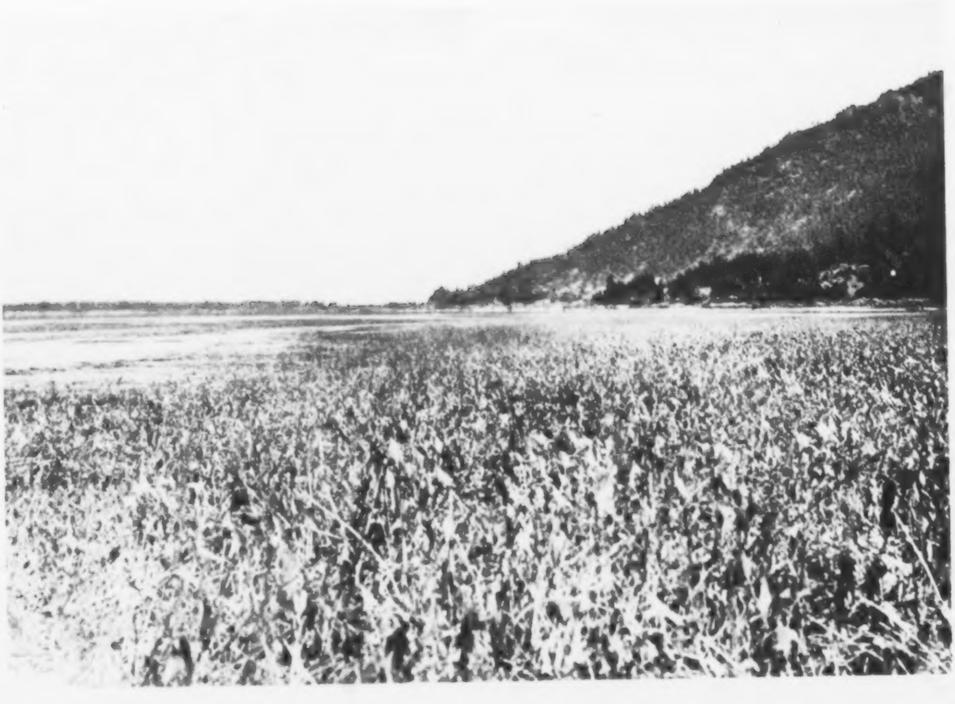

Fig. 10. Wapato and horsetail in Duck Creek Channel.

were obliterated by the prevailing high water.

Leach Lake is one of the chief resorts for geese of the canadensis type, possibly because of the availability of fine gravel, the abundance of needle rush--a favourite food plant, and the nearness to wheat and pea crops.

An un-named lake northeast of Leach Lake, in an elbow formed by a bend in the Kootenay River, contains approximately 160 acres of open water surrounded by a horsetail marsh. All this marsh was dry on September 4, 1947. The lake contains aquatic vegetation of the prevailing type, but to a lesser degree than do other local lakes of similar character.

Six Mile Lake, north of Leach Lake, is contained in what is known locally as Ike Lewis's Island, situated between the two channels of the Kootenay River. It is a narrow lake in two parts connected by a narrow channel, the total length being approximately five miles. Formerly part of Kootenay Lake, during high water, it is now isolated by a high fill that extends between the two railroad bridges over the east and west branches, respectively, of the Kootenay River.

It is similar in character to Leach Lake but contains a much greater amount of aquatic growth. On August 29, 1947, Potamogeton amplifolius, in large circular patches, dominated much of the surface and between these patches the fruiting stems of P. Richardsonii and P. zosteriformis had emerged. Practically all of the lake's surface, in view for several miles, was covered with masses of vegetation. In places water extended into shoreline marshes of horsetail; elsewhere were wide beaches of the prevailing type.

A slough of approximately 50 acres, formerly part of Six Mile Lake but now separated from it by the fill or embankment, lies just inside a sandy ridge that marks the shoreline of Kootenay Lake.

West of Six Mile Lake, across the west branch of the Kootenay River, is a large, shallow marsh said to be much frequented by ducks and Canada geese. This portion of the Kootenay Flats was not studied.

East Branch of Kootenay River. This channel, that carries the waters of Sirdar Lake into Kootenay Lake, is deep but with numerous shallow reaches. A wide sandbar crosses its mouth, and to the east a sand-spit extends out from a wide beach of exposed lake bottom. In some of the river shallows are beds of Potamogeton Richardsonii, but aquatic flora is not plentiful. A gastropod (Succinea hawkinsii Baird), occurs in great numbers and the river beaches are littered with their shells. Cottonwoods on the east bank are tall and handsome with massive trunks, the ground beneath them piled high with flood debris which is partly hidden by a dense underbrush of dogwood and willows.

Kootenay Lake, south end. During the seasonal periods of low water the south shore of Kootenay Lake becomes a wide flat of sand and silt on which are marshes of horsetail and beds of needle rush. The long sand-spit which extends out for several hundred yards from the east side of the east channel is paralleled by another extending from a point a little to the west of the east channel, and by a third from the west side of the west channel. The waters for two or three hundred yards out from the flat are shallow and here and there are patches of aquatics including Potamogeton pectinatus, but at no place is the growth so heavy as in Sirdar Lake or other waters to the south. During migration large numbers of ducks congregate on the beach and the adjacent shallows.

These lakes and sloughs constitute the last of the once numerous resting and feeding places for waterfowl on the Kootenay Flats. Even this remnant is of great importance for actually it represents the largest single unit of first-class feeding ground in the interior of British Columbia.

In July male mallards commence to gather on Sirdar Lake and Leach Lake. The males are followed later by females and young of this species, still later by pintail, green-winged teal, shoveller, and baldpate. Here adult pond ducks continue the late summer moult, and all feed on the rich foods that the lakes provide. On August 27, 1947, the total pond duck population of the flats was estimated to be 9,000.

Safe moulting and feeding places, such as the waters on the Kootenay Flats provide, are essential to the existence of waterfowl. The lakes are also concentration places for migrating shore-birds, and at no place in the interior of the Province have I seen them in such large numbers.

Apart from this economic value, another value, less readily assessed, becomes apparent to one visiting the region in August. I refer to the natural beauty, considered unique in character. Briefly, the territory may be described as a wide grassy plain, revitalized each spring by river silt so that the aspect in summer, when high lands are browned by drought, is one of rich, green fecundity. The deep-set streams margined by willows, the lakes and sloughs, the giant cottonwoods hiding the river behind a wall of green, and the fine river itself with its steady flow of blue-green water--all these together form a scene that has no parallel in British Columbia. When one looks north across the plain and

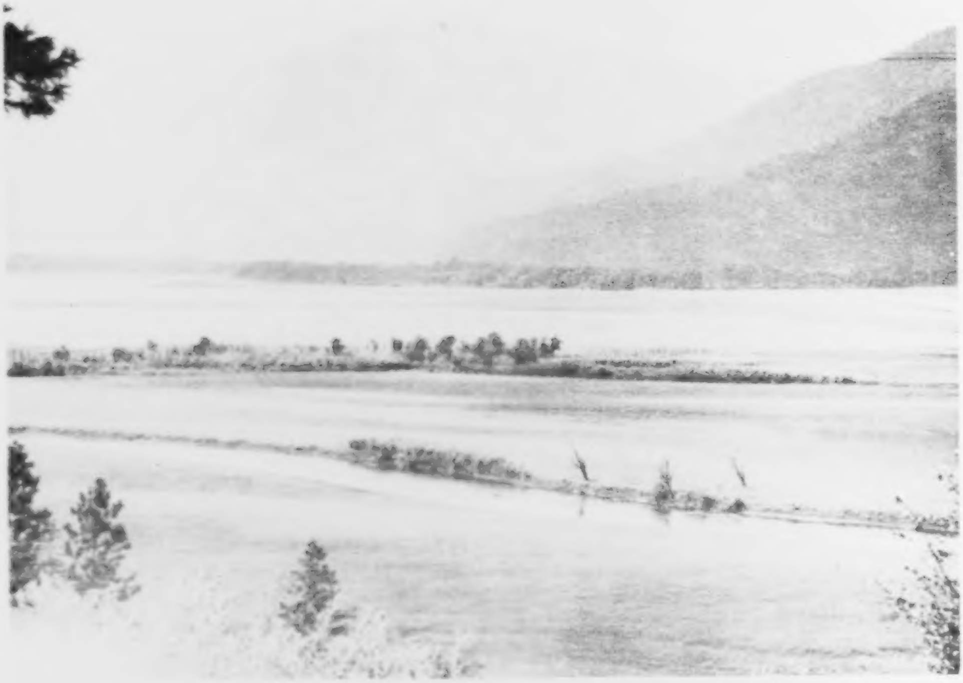

Fig. 11. Duck Lakes 1 and 2; Duck Creek Channel in foreground.

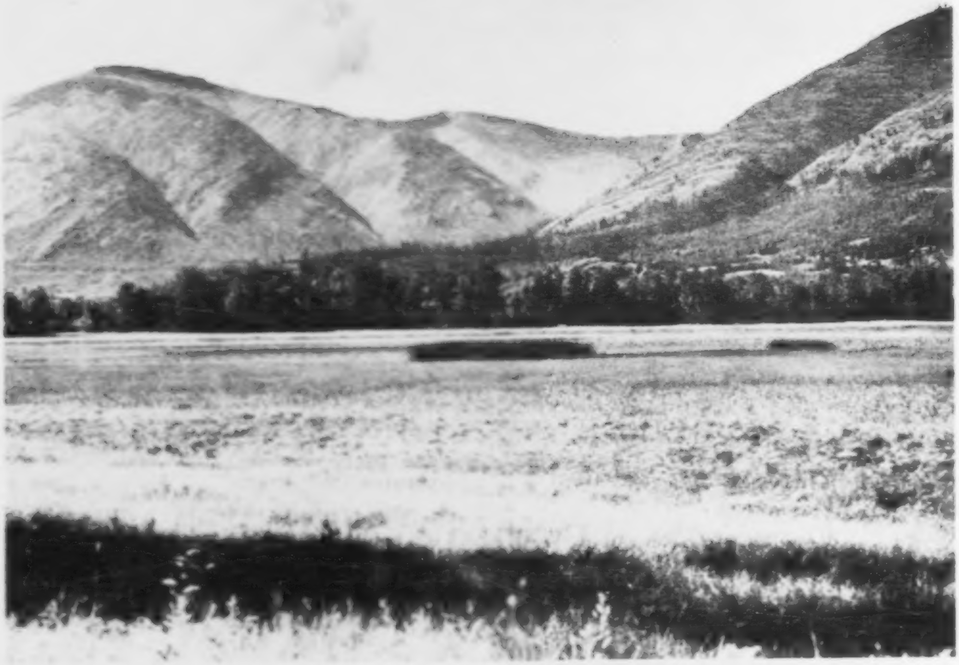

Fig. 12. Mud Lake, west side of Kootenay Flats.

great cumulus clouds billow up from behind the mountains on either side, the beauty is breath-taking.

Changes in Habitat and Bird Population on the Kootenay Flats

The ecology of the Kootenay Flats has undergone radical alterations since Mailliard visited the territory in 1928. He states (6)--

> The bottom land here spreads out on each side of the river for a mile or so, much of it being productive of good pasture for stock and hay for winter feeding. The river banks and some higher spots on the bottom have growths of cottonwoods and willows with small stands of pine here and there, so that there is quite a variety of associations, from marsh and open water to dense groves of large trees.

At that time, during the spring floods, all this area became a lake and remained so for six weeks or longer. Mailliard's work was cut short in early May because of flood conditions, and he reports that "all forms of ground and marsh loving birds were driven away."

Since that time the precise area from which Mailliard unhappily was excluded, as well as other parts of the flats, have been dyked and drained, and most of the cottonwoods, except along the river channels, have been removed. The reclaimed land is given over chiefly to the cultivation of grain and peas. High dykes normally shut out the flood waters, a number of roads cross the reclaimed lands, and drainage ditches are conspicuous features of the landscape.

Goat River, that formerly for the last nine miles of its course cut north through the plain more or less parallel with the Kootenay River and entered Sirdar Lake, was diverted to the Kootenay River at a point about two miles west of Creston. Now its old channel is a quiet slough, between banks lined with cottonwoods, as has been stated.

The high levees of the Reclamation area are covered by cow-parsnip (Heracleum lanatum), fireweed (Epilobium angustifolium), and a variety of sturdy exotics including grasses, thistles, docks, and dandelions; along their sides choke cherry, small aspens, wild roses, and other deciduous trees and shrubs have become established.

This newly created habitat, and the residual forest of cottonwoods and shrubbery situated on the river banks, now maintains a summer population of red-shafted flicker, yellow-bellied sapsucker, hairy woodpecker, eastern kingbird, western wood pewee, warbling vireo, red-eyed vireo, yellow warbler, song sparrow, and probably other species. So, also, a changed environment has provided, in the stabilized waters of irrigation ditches, suitable nesting habitat for mallard, blue-winged teal, and red-winged blackbird. The ground squirrels (*Citellus columbianus* and *Citellus lateralis*), and the chipmunk (*Eutamias ruficaudus*) have colonized this habitat.

More notable, perhaps, are the results which followed the planting of grain and pea crops on the reclaimed flats. One is that the number of Canada geese and mallards visiting the region in late summer and autumn has increased substantially. Both species feed extensively on the grain fields. Similarly, this altered habitat provides food for large numbers of crows, Brewer blackbirds, and savannah sparrows.

It is to be noted that the above describes conditions as slowly established over a decade or so, and as they existed in 1947. The picture in 1948, after a disastrous flood, was quite different, except over a relatively small area approximately 7,000 acres known as Nick's Island.

Food Resources on the Kootenay Flats

The abundance of the plant-food resources of the Kootenay Flats has been indicated, and comments on the animal-food resources, apparent during the months of May, August, and September, will contribute to the pictured background of the region.

Voles of the species *Microtus pennsylvanicus*, abundant in some years, provide food for coyotes and raptores, so also do fluctuating populations of white-footed mice, Columbian ground squirrels, and chipmunks.

Small fishes (*Richardsonius balteatus*), the fry of suckers (*Catostomus* sp.), and the introduced large mouth bass (*Micropterus salmoides*), are abundant and supply food for herons, gulls, terns, and other birds.

Conspicuous in the late summer of 1947 was the enormous number of western spotted frog (*Rana pretiosa pretiosa* Baird and Gerard). The leopard frog (*Rana pipiens* Schreber), was also collected here. Frogs are eaten by mink, great blue heron, marsh hawks, and gulls.

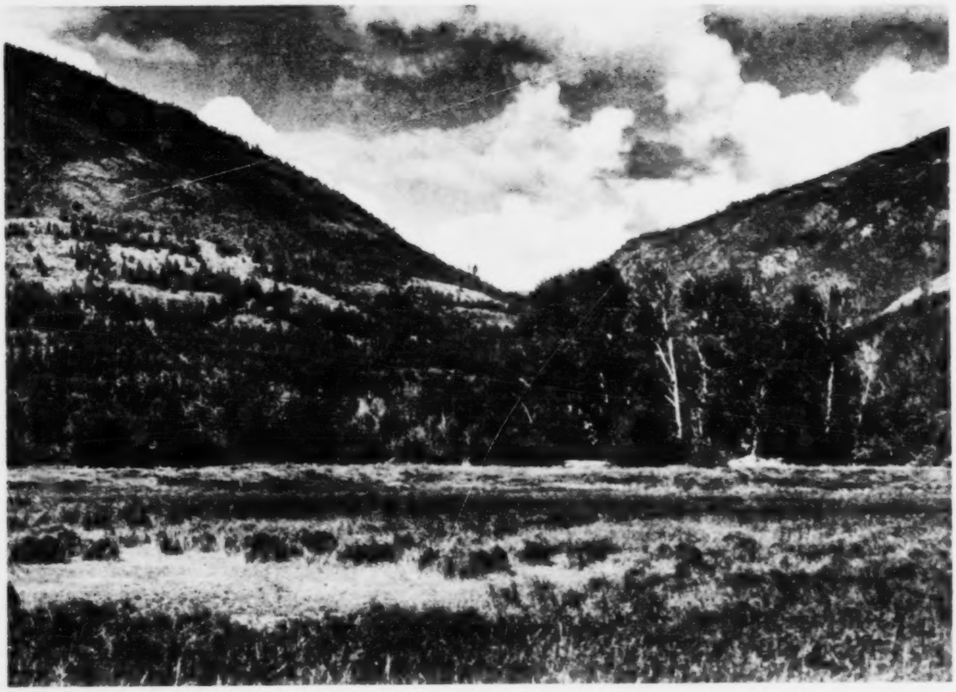

Fig. 13. Summit Creek Valley.

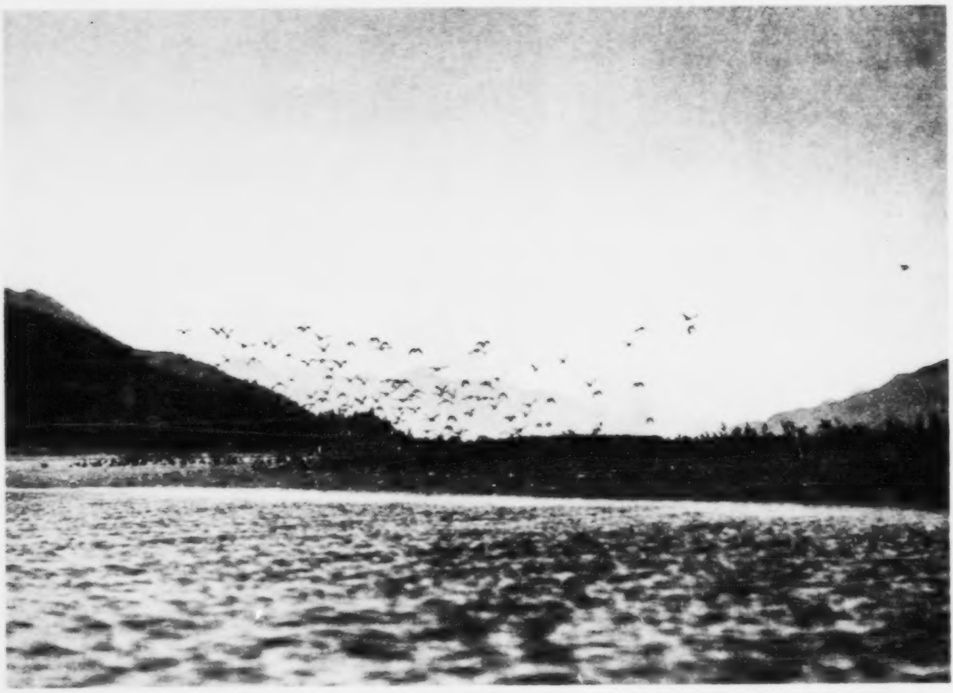

Fig. 14. Channel entrance at south end of Leach Lake; mallards rising from beach.

Aquatic mollusks of four species, viz.; Helisoma subcrenatum Carpenter, Allogona ptychophora Brown, Succinea hawkinsii Baird, and Lymnaea stagnalis are very abundant. Two terrestrial species Oreohelix subrudus Reeve and Oxytoma nuttalliana Lea also occur. Aquatic mollusks are an important item in the diet of ducks, and terrestrial species are eaten by certain land birds and by chipmunks and white-footed mice. It is of interest to note that on May 20, 1948, just prior to the high flood of that year, hundreds of Oxytoma nuttalliana were found on cottonwoods and willows, many of them attached to the trunks six feet and higher above the ground.

Insect life, as it appeared to a casual observer during August and September, is limited to a relatively few groups of which some are conspicuously abundant. Tabanid flies (Chrysops sps.) were so plentiful that the task of collecting some 200 specimens, by stunning them with a slap of the hand as they alighted on one's person, was accomplished in a few hours. A dragonfly (Sympetrum madidum Hook.) hovered low over the horsetail marshes in such numbers as to create the illusion that a copper-coloured mist was rising from the marsh. Damselflies appeared rarely and no nymphs were found.

Tabanid flies are eaten by kingbirds and other bird species; adult dragonflies are important in the diet of pigeon hawks and the nymphs are eaten by a variety of birds.

WOODLAND HABITAT

East of the Kootenay Flats, extending from near the International Boundary to the vicinity of Wynndel village, is a complex of low, rolling foothills and bench lands divided into two parts by the canyon of the Goat River that enters the Kootenay River south of Creston. The town of Creston (1,600 inhabitants by the 1945 census) is situated at a point 14 miles south of Kootenay Lake and seven miles north of the International Boundary. West of the town are the broad, cultivated fields of the Reclamation (Fig. 15), and directly south an area of unreclaimed land east of the Kootenay River, an Indian Reserve, extends south to the International Boundary. East is a sheer, lofty rampart of the Purcell Range and to the north, rising above the foothills and benches, and forming the east wall of the Kootenay Valley, stands a relatively low mountain range, the component mountains defined by intervening, steep, narrow valleys. North of Wynndel the mountains slope more steeply from the valley floor, and along Kootenay Lake they become precipitous. A provincial highway and a branch of the Canadian Pacific Railway traverse the territory, the former continuing north along the east side of Kootenay Lake, the latter crossing to the west side of the Lake at its southern end.

The original forest has long since been removed from the bench lands and much of this territory is now under cultivation, tree-fruits, berries, and alfalfa being the principal crops. Such of the more level lands which so far have escaped cultivation are in process of reforestation. A typical example comprising several hundred acres situated about four miles northeast of Creston carries a somewhat unusual association of conifers and deciduous trees, of which the following species were identified, viz.; lodgepole pine (*Pinus contorta* Dougl.), mountain white pine (*Pinus monticola* Dougl.), yellow pine (*Pinus ponderosa* Dougl.), western larch (*Larix occidentalis* Nutt.), giant cedar (*Thuja plicata* Donn.), paper birch (*Betula alba* L.), Rocky Mountain maple (*Acer glabrum* var. *Douglasii* Hook), and aspen (*Populus tremuloides* Michx). A sparse underbrush consists of hazel (*Corylus* sp.), mountain alder (*Alnus tenuifolia* Nutt.), rose (*Rosa* sp.), waxberry (*Symphoricarpos racemosa* Michx.), false box (*Pachystima myrsinites* Raf.), Oregon grape (*Berberis aquilifolium* Pursh. and *Berberis repens* Lindl.), soopolallie (*Shepherdia canadensis* Nutt.), bracken (*Pteris aquilina* L. v. *languinosa*), kinnikinnick (*Arcto-staphylos uva-ursi* Spreng.), and thimble berry (*Rubus parviflorus* Nutt.). This second-growth forest is fairly open, with many old logging roads, so that walking there is easy and pleasant.

Few birds were seen in these woods during the August migration of 1947, but on the more open slopes above, where logged areas are dominated by brushy thickets, such species as Wright flycatcher, Nashville warbler, solitary vireo, and Oregon junco were met with.

Two species of terrestrial mollusks, viz.; *Oreohelix subrudis* (Reeve) and *Anguispira kochii occidentalis* (V. Martens) were found there in great abundance.

Certain logged-off yellow pine slopes which rise abruptly from the valley floor near the International Boundary, and which have been swept by successive fires, are now semi-arid. The residual thick cover, chiefly deciduous trees and shrubs, is limited to the draws where moisture is held longest. On the open hillsides is a sparse shrubbery of snow-brush (*Ceanothus sanguineus* Pursh.), nine-bark (*Physocarpus opulifolius* (L)), and mock orange (*Philadelphus Lewesii* Pursh.). A pungent wormwood (*Artemisia absinthium* L.) grows abundantly on the lower slopes, and here also are such characteristic dry-belt plants as *Brodiaea Douglasii* Wats, *Delphinium Menziesii* DC., *Telbima parviflora* Hook, and *Polemonium humile* R. and S.

Other mountain slopes farther north on the east side of the valley, which have been logged less intensively and still carry

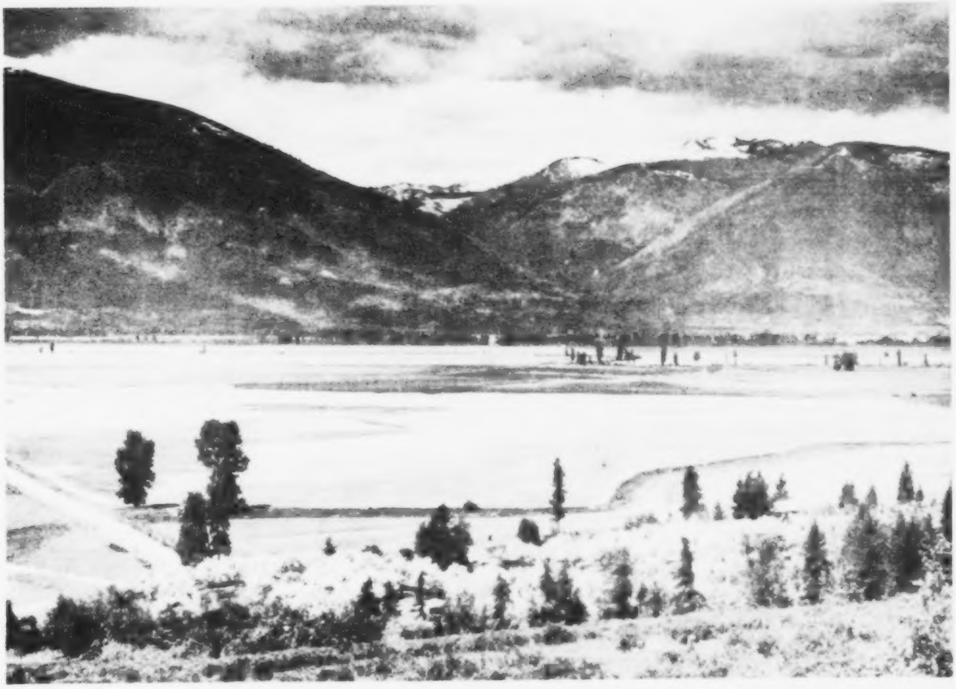

Fig. 15. Reclaimed area on Kootenay Flats west of Creston.

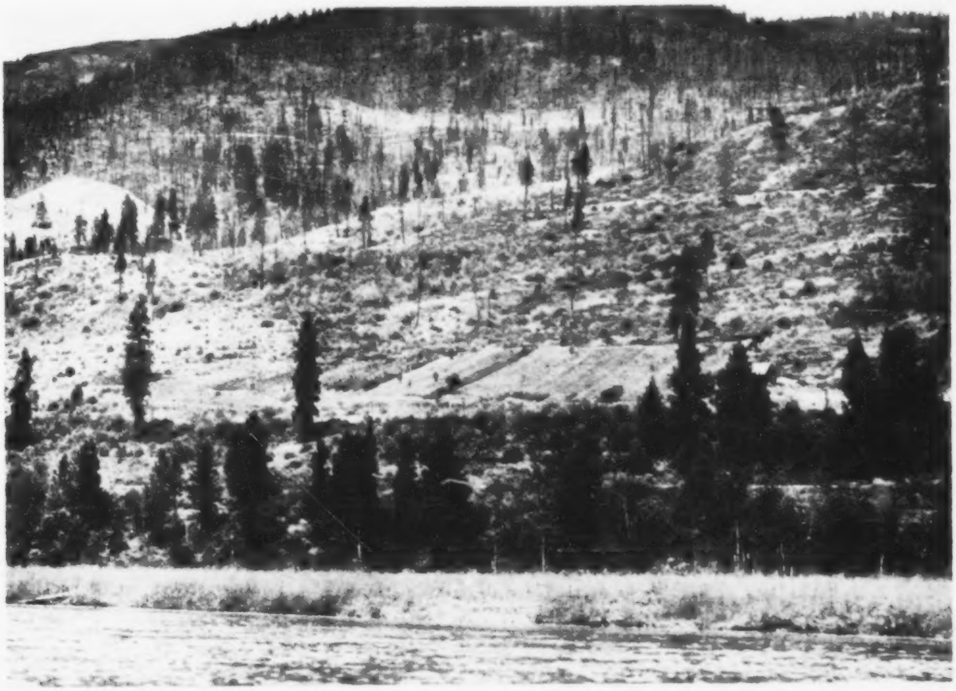

Fig. 16. Drywash Mountain.

some of the original forest of yellow pine, Douglas fir, and giant cedar, are in a less degenerate condition with shrubbery heavy and continuous. From May to August a succession of flowering plants decorate the open places and the crevices of rock outcrops. Among the more conspicuous species are: Viola adunca Smith, Viola orbiculata (Geyer), Erythronium grandiflorum Pursh., Trillium ovatum Pursh., Collinsia tenella, Castelleja sp., Corydalis aurea Willd., Clematis columbiana Hornem, and Apocynum androsaemifolium L.

One such place, referred to in this paper as Drywash Mountain (Fig. 16), in which bird-life was abundant in early August, 1948, is situated about half-way between Wynndel and Sirdar. Here Drywash Canyon broadly indents the face of an open mountain that rises to an altitude of 5,000 feet. On the lower portion of the mountain, several hundred feet above the highway, is a narrow, sloping bench on which small fruits and vegetables are grown. Above this bench, for 500 feet or so, the logged-off hillside is covered thickly with shrubbery among which nine-bark is the most conspicuous species. Each of several shallow draws contains a small running spring and in these damp places grow mountain alder, mountain birch, Rocky Mountain maple, willows, and small cottonwoods. Above the open landscape, extending across Drywash Canyon and to the mountain summit, is an open and partly burnt forest of yellow pine, Douglas fir, and western larch. A logging road, ascending the slope in a series of switch-backs, provides easy access to this territory, and during its ascent one passes through habitats occupied by distinct associations of birds. Thus, along the bottom, western wood pewee, catbird, yellow warbler, Macgillivray warbler, and American goldfinch were numerous, while higher, along the edge of the burn, were seen the first red-shafted flicker, Wright flycatcher, olive-sided flycatcher, Audubon warbler, and Oregon junco. Characteristic of the burn itself at higher altitudes were hairy woodpecker, Arctic three-toed woodpecker, and Clark crow. Certain other birds such as American robin, house wren, western tanager, spotted towhee, pine siskin, and chipping sparrow occupied each of these successive zones. By mid-August it became apparent that the lower slope of the mountain was a broad highway of migration along which many small land birds travelled. Each day on which the place was visited some new arrivals were recorded and the numbers of individuals representing such common species as spotted towhee, western tanager, catbird, and house wren increased or diminished from day to day.

Arrow Mountain (the Goat Mountain of Mailliard) directly north of Creston, is relatively well-timbered chiefly by second-growth Douglas fir and lesser amounts of yellow pine and western larch. An old mining road, long disused and in disrepair, ascends this slope, near its base passing through thick, shady woods of mountain birch, maple, and willow alongside a spring creek. Here are skunk cabbage (*Lysichiton americanum* Schott), star-flowered Solomon's seal (*Smilacina stellata* (L) Desf.), and other plants characteristic of the Columbia Forest Biotic Area. August bird-life on this seemingly attractive mountain was less plentiful than on the recently logged and fire-swept slopes described above.

In places along the margin of the Kootenay Flats are narrow belts of deciduous trees and shrubs, the chief species being trembling aspen of small stature, willows, service berry (*Amelanchier Cusickii* Fer.), wild cherry (*Prunus emarginata* Dougl.), choke cherry (*Prunus demissa* Nutt.), elderberry (*Sambucus glauca* Nutt.), and tree-size black hawthorne (*Crataegus brevispina* Dougl.). Elderberry also attain a notable growth and probably are most abundant here than elsewhere in British Columbia. A good example of this habitat type is Sutcliffe Point situated about a half-mile north of Creston. This is a low, rocky spur of the mountain to the east jutting on to the reclaimed flats. Outward from the relatively wide base, which is timbered with Douglas fir, a narrowing point of five acres or less, covered with the deciduous growth listed above and distinguished by a few tall black cottonwood and aspen, slopes to the valley bottom. Surrounded on three sides by the almost treeless plain into which it extends, and well supplied with wild fruits and thick cover, this place proved very attractive to land birds during the autumn migration. Thus, on the morning of August 20, 1948, the following birds were counted there: Cooper hawk--1, red shafted flicker--3, yellow-bellied sapsucker--3, eastern kingbird--12±, western wood pewee--5, tree swallow--50±, cliff swallow--20±, barn swallow--2, house wren--1, American robin--60±, mountain bluebird--2, cedar waxwing--20±, red-eyed vireo--3, orange-crowned warbler--1, yellow warbler--3, western tanager--4, black-headed grosbeak--1, pine siskin--4, spotted towhee--2.

Orchards of tree fruits seemed relatively barren of bird-life in early summer, perhaps a result of the successive sprayings to which they are subject. In August, robins and western tanagers were seen feeding on cultivated cherries, and, according to one orchardist interviewed, the damage done by birds, robins particularly, is considerable.

On several farms are old mulberry trees that bear heavy crops of fruit and these attract many birds from late July through August. Species found feeding on mulberries were: red-shafted flicker, downy woodpecker, eastern kingbird, catbird, American robin, varied thrush, hermit thrush, Swainson thrush, veery, cedar waxwing, red-eyed vireo, yellow warbler, American redstart, Bullock oriole, western tanager, black-headed grosbeak, Cassin purple finch, pine siskin, spotted towhee, and song sparrow.

Wooded areas on the unreclaimed portions of the flats, situated chiefly on river and creek channel banks, are dominated by black cottonwood and aspen, but prominent also are tree-size willows, high-bush cranberry, and dogwoods (Cornus pubescens Nutt.) that measure 30 feet and more in height. There are no "pines" on the flat as Mailliard reported (6), neither do old residents of the district remember any being there in earlier days. The wooded areas, which are inundated by the freshets, are catch-alls for flood debris, consequently, their floors are piled high with years' accumulation of drift logs, branches, planks, boxes, and other rubbish. Through this tangle grow small willows, dogwoods, nettles, and many flowering plants, to form a jungle which only the most enthusiastic traveller would attempt to penetrate. Elsewhere robust stalks of clematis (Clematis ligustidifolia Nutt.) reach high up the trunks of great cottonwoods so that in mid-summer masses of heavily foliaged branches, profuse with blossom and seed, droop earthward to mask the shaggy tree bolls. So, also, this lusty plant climbs over prostrate logs and winds through the shrubbery in a confusion of erratic growth.

During the autumn migration small land birds followed the margins of these woods on creek or river side, and such species as red-eyed vireo, warbling vireo, Audubon Warbler, American redstart, and yellow-throat sometimes were common there.

Benches and foothills on the west side of the valley along the base of the Nelson Range, a district known as West Creston, would seem to be in somewhat the same condition as Mailliard saw them in 1928 (6); although the higher slopes have since been logged and present the same desolate appearance of wilderness slums as do the mountain slopes on the east side of the valley. Little agricultural expansion has taken place because facilities for storing irrigation water have not been developed, and although considerable logging was done in the past 20 years yet some of the original forest cover remains. Here the conifer association is predominantly giant cedar, western hemlock (Tsuga heterophylla Sarg.), western larch, grand fir (Abies grandis Lindl.) and lodgepole pine. Some mountain hemlock (Tsuga mertensiana Carr.) also is present. There is no yellow pine, at least I saw none, and deciduous tree species are not plentiful.

In the wide bottom of Corn Creek are numerous old cedars, hemlocks, and a few grand fir. Skunk cabbage in the deep, moist soil grows to a great height, and here jewelweed (Impatiens sp.) was flowering in early autumn.

In these woods, during early September, black-capped chickadee, red-breasted nuthatch, Oregon junco, golden-crowned kinglet, and Canada jay were plentiful. The only goshawks recorded were seen here.

Boundary Lake, 1/4 by 1/2 mile, altitude 4,307 feet, headwaters of Boundary Creek, lies in a mountain valley 18 airline miles southwest of Creston and about one-third mile north of the International Boundary. The creek flows in an easterly direction through the forested valley, that is at first level and then precipitous, to enter the Kootenay River south of Porthill, Idaho. Willow thickets and sedge marshes occupy much of the margin between the forest and the generally boggy shores of this small lake. On drier, moss-covered soil near the lake's outlet are small islands of spire-shaped spruces standing apart from the main forest.

On some of the steep mountain slopes above the valley the forest cover has been burned off and no sign of regeneration can be seen from below. The valley itself contains a fine forest of virgin timber, the last of its kind adjacent to Creston. The species represented are Engelmann spruce, western hemlock, giant cedar, mountain white pine, and alpine fir (Abies lasiocarpa (Hook.) Nutt.).

On the Idaho side the valley is included in a National Forest Reserve. On the Canadian side the timber is currently being removed. On the logged-off portions, where the soil has been cut through by caterpillar tractors, all vegetation destroyed, and erosion under way, the picture is one of a wilderness slum in the making.

Where primitive conditions still prevail the forest cover provides habitat for a semi-open shrubbery in which Rhododendron albiflorum Hook., and Vaccinium sp. are conspicuous. Here also are numerous flowering plants, among them Veratrum viride Ait., Xerophyllum tenax Nutt., Eupatorium maculatum L., Pedicularis bracteosa Benth., Mimulus moschatus Dougl., Mertensia paniculata Ait., Delphinium glaucum Wats., and Trautvetteria grandis Nutt.

Birds characteristic of this habitat, and recorded nowhere else in the Creston region are: American three-toed woodpecker, mountain chickadee, and Hudsonian chickadee.

FAUNAL CLASSIFICATION

The native woodlands on the benches along the east side of the valley represents a merging of two biotic areas, viz.; the Columbia Forest that reaches highest development in the valleys of the Selkirk Mountain complex to the north, and the Dry Forest Biotic Area as it is represented in the southern portion of the Rocky Mountain Trench to the east.

In the flora this merging is exemplified by the common association of yellow pine and western larch, characteristic species of the Columbia Forest. This merging is apparent also in the shrubbery that includes hazel and wild cherry in association with nine bark, snow brush, choke cherry, and mock orange, while the "wet belt" red elder is replaced by the "dry belt" black elder.

Some flowering plants characteristic of the grasslands and woodlands of the Dry Forest and occurring commonly at Creston are: *Brodiaea Douglasii* Wats, *Delphinium Menziesii* DC., *Polemonium humile* R. and S., *Tellima parviflora* Hook., and *Clarkia pulchella* Pursh.

The summer bird population contains elements of both biotic areas, viz.; black-headed grosbeak and chestnut-backed chickadee characteristic of the Columbia Forest, and mourning dove, Bullock oriole, catbird, spotted towhee (*Pipila maculatus nevadensis*), and American goldfinch (*Spinus tristis pallidus*) characteristic of the Dry Forest. Some of the last may represent recent invasions into territory made suitable by land clearing and agriculture. The absence of mountain chickadee and Traill flycatcher is notable.

Wooded areas on lower levels along the west side of the Kootenay River are typical of the Columbia Forest Biotic Area. In the Boundary Lake Valley, at an altitude some 2,500 feet higher, there is an intrusion of species more clearly associated with the Sub-alpine Forest Biotic Area. Alpine fir is more abundant. The plants *Xerophyllum tenax* Nutt., *Veratrum viride* Air., *Rhododendron albiflorum* Hook., *Mertensia paniculata* Ait., and the avian species *Picoideus tridactylus* and *Parus hudsonicus*, are examples.

The 176 species and subspecies of birds discussed in this paper do not represent a complete picture of the region's bird fauna. Adequate information as to the early spring migration and of the winter population is lacking. Undoubtedly intensive studies at these seasons would add many additional species to the list. To a lesser degree this applies also to the mammal list comparing 41 species and subspecies.

EARLIER STUDIES IN THE CRESTON REGION

Fortunately there is available an account of the Creston Region as it appeared in 1928 (6). In that year the late Mr. Joseph Mailliard, accompanied by a party of two, spent the period April 30 to June 5 studying the bird and mammal fauna of this part of the West Kootenay district. The majority of the 81 species of birds and 10 species of mammals recorded by him were obtained near Creston. This paper is referred to frequently in the following pages.

In 1929 Mr. H. M. Laing, working in the interests of the National Museum of Canada, made a collection of small mammals and a few birds during the period August 7 to August 23. His manuscript notes concerning 13 mammal species, of which specimens were taken, and a list of 71 species of birds observed, are filed in the National Museum of Canada.

The bird-fauna inhabiting the northern part of Idaho, in the so-called pan-handle, probably is closely similar to that of the Creston Region of British Columbia, and thus it seems advisable to mention several papers relating to that State.

In 1917 Burleigh (3) studied the summer birds in the valley at Clark's Fork, Bonner County, Idaho, and in mountain territory 40 miles north of that place and close to the Idaho-British Columbia boundary. Near Clark's Fork he found bobolink fairly common, and mentions one sight record of the chat. From mountain territory he records Franklin grouse, Townsend warbler, pine grosbeak, all apparently nesting. His record of the horned lark (*Eremophila alpestris merrilli* (Dwight) could be an error in identification as the subspecies *Eremophila alpestris arcticola* Oberholser is the form most likely to be found at timberline. Of the mountain birds only the last has been recorded from Creston; the other forms mentioned can be expected to occur there.

Rust (10, 11) reports a specimen of avocet from Kootenai County, Idaho, and as this species is recorded also from Upper Arrow Lake, British Columbia (5), it may be expected to occur on migration on the Kootenay Flats.

Rust also lists the following species and subspecies from Kootenai County, viz.; red-throated loon, surf scoter, screech owl, snowy owl, rough-legged hawk, long-eared owl, Say phoebe, Bohemian waxwing, northern shrike, and common redpoll. All these forms are likely to occur in the Creston region.

Nine species and subspecies of transient birds and one resident species, collected or observed at Creston close to the Idaho boundary apparently have not yet been recorded from that State (2). These are: pigeon hawk (*Falco columbarius suckleі* Ridgway), semi-palmated plover, Baird sandpiper, semipalmated sandpiper, herring gull (*Larus argentatus smithsonianus* Coues), Sabine gull, horned lark (*Eremophila alpestris arcticola* Oberholser), myrtle warbler, Savannah sparrow (*Passerculus sandwichensis anthinus* Bonaparte), and Hudsonian chickadee (*Parus hudsonicus cascadensis* Miller).

ACKNOWLEDGMENTS

During the course of this study courtesies were extended, and information on local wildlife submitted by many persons, among them Corporal R. Whittaker, Royal Canadian Mounted Police, Inspector F. C. Kearns, of the British Columbia Game Department, Provincial Game Warden George Lines, and Mr. Charles Sutcliffe whose knowledge of the district and occasional companionship in the field were exceedingly helpful; Mr. Charles Wilson contributed several records of birds observed, as did Mr. Walter B. Johnstone, Dr. O. H. Hewitt, and Mr. Webster Ransom of the United States Fish and Wildlife Service who in August operated a duck-banding trap at the south end of Kootenay Lake. Mr. Arne Arnstead, who runs a trap-line on the Kootenay Flats and on mountain territory to the east, supplied information on the status of fur-bearing animals; to the United States National Museum I am indebted for the identification of certain mollusks; Mr. A. E. Porsild and Mr. George A. Hardy identified certain plant specimens; Mr. Earl Godfrey, National Museum of Canada, and Dr. G. Clifford Carl, Provincial Museum of British Columbia, arranged for the loan of needed mammal specimens, and to the first I am indebted also for an opportunity of examining a manuscript list of mammals collected near Creston in 1929. The accompanying map was prepared by Mr. C. Sugden, Canadian Department of Agriculture. Dr. R. E. Orr re-examined some of the birds and mammals collected at Creston and now in the California Academy of Sciences Museum.

All this varied co-operation was much appreciated and is gratefully acknowledged here.

THE BIRDS

Gavia immer (Brünnich). Loon.

Apparently loons seldom visit the shallow lakes on the Kootenay Flats; one was seen and heard calling on Sirdar Lake, August 13, 1947, and another was observed near the outlet of this lake, August 6, 1948. The only other record refers to the south end of Kootenay Lake where one was seen, September 14, 1947.

Colymbus grisegena Boddaert. Red-necked Grebe.

On May 7, 1948, one was observed at close range in a narrow canal alongside the main highway where it passes through the

Reclamation between Creston and Wynndel. This individual or another was in the same place three days later. There are no other records. No grebes with the possible exception of *Podilymbus podiceps* nest on the Kootenay Flats, so all must be regarded as transients.

Colymbus auritus Linnaeus. Horned Grebe.

Two adults, moulting to winter plumage, accompanied by one full grown young were examined at close range through 8X binoculars on Sirdar Lake, August 13, 1947. These were considered to be a family on migration. Other records for Sirdar Lake in 1947 are: September 2--5; September 8--1; September 10--10; September 11--13. All were identified as young of the year. On August 11, 1948, a family consisting of 2 moulting adults and 2 full-grown young was observed on a flood-pond, and on August 27, 1948, a total of 8 was flushed from weed beds in the shallow south end of Sirdar Lake. All were wild and took wing at 60 to 100 yards as I approached them slowly in a canoe.

The only spring record is that of an adult in full breeding plumage seen on a flood-pond May 10, 1948.

Colymbus caspicus Hablizl. Black-necked Grebe.

On September 10, 1947, 3 individuals of this species were identified on Sirdar Lake. The birds swam close to a larger number of horned grebe so that the characteristic straight, black neck and erect carriage of the first were contrastingly apparent.

Aechmophorus occidentalis (Lawrence). Western Grebe.

This grebe was recorded numerous times during spring and autumn on the north end of Sirdar Lake and at the south end of Kootenay Lake, the dates and numbers being as follows: May 7, 1948--32; May 10, 1948--150±; May 17, 1948--40; August 1, 1947--20±; August 29, 1947--6; August 6, 1948--21; August 19, 1948--28.

Podilymbus podiceps (Linnaeus). Pied-billed Grebe.

Two individuals, perhaps paired, were seen, May 22, 1947, in a narrow flooded ditch on the Reclamation. In such places, of which there are many, this grebe may nest but conclusive evidence is lacking. Four, possibly a family, were swimming close together near the shore of Sirdar Lake on August 7, 1947, and single birds were recorded at Sirdar Lake, August 13, 1947, and on a slough near Leach Lake, August 14, 1947.

Ardea herodias Linnaeus. Great Blue Heron.

Small colonies of great blue heron nest along the Kootenay River from near the International Boundary to a point about 2 miles from Kootenay Lake, The total population, 1947-1948, was estimated to be 40 pairs. The birds ranged freely over this territory so that it was not practicable to make an accurate count. On May 20, 1948, I examined 5 nests at close range through 8X binoculars. Each of 3 was in a tall aspen, the trees about 10 inches in diameter and approximately 75 yards apart. Two others similarly placed were at distances of 200 and 300 yards, respectively, from the group of 3. The bulky stick nests were at about equal heights above the ground, probably close to 50 feet, and seemed to have been recently repaired or added to, but no herons were in the immediate vicinity.

Mr. E. G. Haynes told me of visiting a larger colony on the east channel of the Kootenay River about two miles from where the river discharges into Kootenay Lake. In June, 1948, about 20 nests in tall cottonwoods close to the river were occupied, and courtship of mated pairs was observed by Mr. Haynes. Other small colonies and single nests have been reported from places between these two extreme southern and northern points on the Kootenay Flats.

All summer great blue herons were seen daily, standing in the numerous channels that wind through the flats, and in the larger lakes where shallows extend outward for a half-mile or so. A total of 14, of which 8 were full-grown young, was counted on August 13, 1947, during a circuit of Sirdar Lake by canoe. With rare exceptions both adults and young were exceedingly wary and did not permit a close approach.

The latest record made personally is of a single bird at the north end of Sirdar Lake on November 12, 1947; however, I was informed that a number wintered in the vicinity and that 7 were counted there on January 9, 1948.

Wah-Kaw is the Kootenay Indian name for the great blue heron.

Attempts to secure herons for subspecific identification were not successful; when breeding specimens from this colony become available they may well prove to be of the subspecies Ardea herodias herodias, the race representing the species in southern Alberta.

Botaurus lentiginosus (Montagu). American Bittern.

The earliest record is of a single bird on May 10, 1948. Three were observed in nuptial flight over a marsh area on the Kootenay Flats, May 18, 1948, and 2 were recorded at the same place on the following day. None was seen during the summer. In 1947 single birds were flushed on 4 occasions between August 18 and September 11 and a dead bird, shot by a hunter, was found on September 15. This specimen is a bird of the year with down filaments on the head.

Cygnus columbianus (Ord). Whistling Swan.

Reported to be abundant during the spring migration that reaches a peak about mid-April. Sixty were counted on Duck Creek Channel, April 6, 1948, and about 1 week later a large flock on Six Mile Lake was estimated to number 300±. It was reported that 3 members of the population frequenting Duck Creek Channel remained in the vicinity until approximately July 15 and this statement was personally verified in part. The 3 swans were last seen by me on May 24, the day I left the district for a 2 months' absence, and on August 7, 1 swan was on the adjacent Sirdar Lake. Subsequently until September 18 this bird was in sight each of the many times the lake was visited and through August its wariness and general behaviour indicated that the annual full moult was in progress. Often the bird stood in the shallows until approached when it swam or walked ashore and then disappeared into an extensive horsetail marsh, never permitting me to come closer than an estimated 500 yards. On September 18, when apparently the full power of flight had been gained, the swan was observed to be much less wary and no longer sought cover in the concealing marsh but took wing to fly some distance before alighting again on the lake.

Only one record for the autumn migration is available, viz.; Leach Lake, October 26, 1947--6.

Cygnus buccinator Richardson. Trumpeter Swan.

In the winter of 1947-1948, 2 bands of swans, numbering 22 and 28, respectively, were observed numerous times by many people. The bands frequented three stretches of open water, one at the outlet of Duck Creek Channel, one at the outlet of Sirdar Lake, and the third at the outlet of the west branch of the Kootenay River. All these places are close either to the main highway or to the Canadian Pacific Railway. Game Warden George Lines examined the birds through 8X binoculars and saw none with yellow markings at the base of the bill. From his description it was clear that an uncounted number were birds of the year. He described the voice as deep and hoarse. In view of what seems to be a steady increase of trumpeter swans in British Columbia, and considering also that whistling swans do not commonly winter so far north, it seems probable that these wintering birds were trumpeter swans.

Fifteen trumpeter swans, all birds of the year, were studied on May 6 and 7, 1948. Very likely these had formed part of the winter population. One band of 8 stood on the muddy edge of a flood-pond close to the Duck Creek Channel, resting, preening, and at times walking about on the mud. The remaining 7 were together on the water about 50 yards distant. Some were feeding, and in this shallow water were able to reach the bottom by arching the neck and submerging little more than the head. The feeding area is one on which wapato grows abundantly and very likely this was the food sought.

Branta canadensis (Linnaeus). Greater Canada Goose.

Conclusive evidence of Canada geese nesting on the Kootenay Flats was not obtained. A spring migration involving some thousands of birds is reported by Creston residents, and the species becomes common again in August; in recent years, at least, some have wintered there. In the summer of 1947 the first observed arrivals, a flock of 30±, was recorded, August 1, on the east shore of Sirdar Lake. Later this flock, or another of similar size, frequented the wide, open beach at the south end of Kootenay Lake. Sometimes, scattered here and there over the flat and partly concealed by the light marsh growth, the geese rested on their bellies, or they stood in regular alignment at the water's edge, or they grazed among an open growth of short horsetail.

The main population, however, was centred on Leach Lake. Here the preferred resting place, used constantly by the whole population, is a wide beach of exposed lake bottom bordering a sedge meadow along the southwest shore where a small stream discharges its waters over a gravel bottom. Evidently one of the attractions of this place is a plentiful supply of fine gravel; another is the great quantity of needle rush that covers much of the beach. This population was first observed on August 18, 1947, when it numbered 100±, exclusive of a larger number of *leucopareia* and *minima*. Subsequent observations indicated that a gradual increase took place until a maximum of 300± was reached on September 3. At all times *leucopareia* and *minima* associated with the larger form, each of the three segregated within the compass of the general flock. On the basis of comparative size alone it was usually not difficult to identify the three forms--species, as I prefer to call them. The differences in the voices also aided in identification.

The reaction to danger, as expressed by the different behaviour of the three species when I drifted towards them in a canoe, never varied. Groups of canadensis, the largest and darkest birds, many of them young of the year, were the first to leave--while the canoe was yet a quarter-mile or more from the beach. After an interval of 10 minutes or so, during which time I had drifted closer by at least 100 yards, the leucopareia contingent rose. The smaller group of minima sometimes permitted an approach as close as 50 yards before it, too, left the beach. All the various flocks finally came together again on some distant part of the lake shore.

Observations in the autumn of 1948 parallelled those of the previous year. The first canadensis, a flock of 6, was recorded, August 6, on the south shore of Kootenay Lake; a flock of 77 including all three species was counted on a field in the Reclamation, August 11, and on September 11 the mixed population at Leach Lake was estimated to number 500 approximately.

In 1947 these geese sought their food chiefly on the wheat stubble and pea fields, visiting the fields morning and evening and spending most of the daylight hours on Leach Lake. Thus at 7.30 a.m., August 19, geese had started a return to the lake after a morning's incursion of the grain fields, and during the next half-hour flocks passed overhead in the following numbers, viz.; 7, 10, 15, 12, 48, 6, 10, 20.

In 1948 grain and peas were available only on Nick's Island; the remainder of the reclaimed farm lands lay fallow after the flood-water had drained, or been pumped, away. Some fields, however, produced a lush growth of weeds and on these the geese pastured in late August. Geese seemed to show a preference for this green food, at any rate at this time they were seen more frequently on summer fallow than on the grain fields. Thus, on August 25, between 2:00 and 3:00 p.m., approximately 500 occupied a field on which two flood-ponds still remained. The dry portions of the field, vividly green with vegetation, were being ploughed by a single tractor, so that several wide ribbons of freshly turned earth stood out prominently on the green expanse; the geese in three main bands were strung out on the green, unploughed areas and along the margin of the larger flood-pond. Perhaps the majority was canadensis; some much smaller birds, probably leucopareia, were conspicuous, but what percentage of the total these constituted could not be determined. Some were grazing, others stood in various attitudes of repose. Once several small flocks of canadensis rose and left the field lying in the direction of Leach Lake, while others coming from that direction alighted among the birds on the field.

During this time the tractor continued to operate, travelling in a straight line for about one half-mile then turning at right angles along the width of the ploughing, thus approaching one or another of the flocks each time it made the circuit. The birds rose at distances of 60 yards or so to alight again shortly after on another part of the field--actually they were merely moving out of the way of the tractor and none showed evidence of alarm.

At 9:00 a.m., on the following day about the same number of geese were on the field, and shortly afterwards when I paddled around Leach Lake only 50 were counted on the beaches. It was assumed, therefore, that almost the entire population had been associated on this particular feeding ground.

In the winter of 1947-1948, apparently a substantial number of Canada geese remained on the Kootenay Flats. The winter was unusually mild and exceptional also in that some fields of oats remained unharvested, thus providing food for numbers of geese and mallard in excess of the normal winter population.

Branta leucopareia (Brandt). Lesser Canada Goose.

At Leach Lake, August 19, 1947, approximately 200 leucopareia were associated on a wide beach with a smaller number of canadensis and minima. All of the first were conspicuously white below, a character emphasized by the condition of strong sunlight under which they were studied as with the sun behind me, and propelled by a brisk onshore wind, I drifted towards them in a canoe. Possibly these were non-breeding yearlings representing part of the earliest southern migration. At any rate none had the appearance of a bird of the year, and it is known that the main migration composed largely of adults and young takes place in October.

The population increased to an estimated 300 by September 3. In 1948 the first, a flock of 22, was recorded on August 10.

Branta minima Ridgway. Cackling Goose.

First recorded August 8, 1947, when a flock of 16 was observed on the beach at Kootenay Lake. At Leach Lake, August 18, approximately 100 accompanied a larger number of geese of the canadensis group, as has been stated. In this company the relatively short necks and long tarsi of minima were apparent. All appeared to be adults, or yearlings, except six smaller and darker birds accompanied by a normal-coloured adult that may have represented a family group.

This population remained at Leach Lake and its vicinity at least until September 13. On that date at 6:00 p.m., a flock of 45, and another of 14, were seen in flight and the characteristic voice of the species was heard as the birds passed overhead.

Records for 1948 are: August 10--8 at Leach Lake; August 13 --7 on the beach at Kootenay Lake.

Anser albifrons (Scopoli). White-fronted Goose.

Reported by hunters to be a regular transient in autumn on the Kootenay Flats. Three were shot by Mr. V. Mawson at Leach Lake, October 5, 1947, and Mr. Walter B. Johnstone has submitted the following records from his files, viz.; October 14, 1942--1 shot from a flock of 13; October 18, 1943--200 estimated; October 13, 1944--85 counted.

The subspecies, presumably, is Anser albifrons albifrons (Scopoli).

Chen hyperborea (Pallas). Lesser Snow Goose.

A small flock was observed by Game Warden Lines and others on Sirdar Lake, November 11, 1947.

Anas platyrhynchos Linnaeus. Mallard.

The mallard is the common nesting duck of the region; it is abundant during spring and autumn migrations, and recently has wintered in considerable numbers.

The majority of the population nests on hillsides above the flats, and in the vicinity of the levees, drainage ditches, and flood-ponds of the Reclamation. In May, 1947, a normal year, the nesting population was estimated to be 40 pairs. A flock of 23 adult males, observed May 22, on a flooded area just outside of the dyked land, was considered to represent a post-nesting concentration. On the same waters were three mated pairs.

In 1948 each of several flood-ponds that were visited by me regularly during the period May 9 to May 19 contained one or two males, sometimes alone and inactive on their territories, sometimes in company with their respective females that obviously were nesting in the vicinity. On May 10 a total of 16 pairs was counted during a survey of possible nesting grounds distributed over approximately 10,000 acres of the Reclamation. It is to be noted that nesting success on these lands probably was a complete failure because of the subsequent disastrous flood.

In early May before the river rises to flood the unreclaimed portions of the flats this particular area has the appearance of a first-class nesting habitat; cover is adequate and vegetable as well as animal foods are readily available. However, the primitive flood-plain would seem to be little used as a nesting ground. A careful search for nests over several square miles in May, 1948, was unsuccessful, although a total of six pairs of mallards was observed there. The reason is obvious; no nests would be likely to escape destruction by flooding unless the eggs hatched before the end of May. Another adverse factor is the scarcity of food for young ducks during the flood period when the rich feeding grounds are largely inaccessible. There may be some post-flood nesting on this territory as in 1947 I observed 2 broods, not old enough to fly; one on August 12, the other on August 16. Again on August 19, at Summit Creek, an adult female alighted beside my canoe where she acted in the manner characteristic of a female when defending young.

In 1947 the first autumn concentration of mallards, approximately 800, was observed on August 7 near the south end of Sirdar Lake; some stood on the open beaches, others loafed or fed in the shallows. The numbers of this population waxed and waned during the following 6 weeks, to the extent the following estimates indicate, viz.; August 7--800; August 8--450; August 16--50; August 25--2,500; August 26--2,700; August 28--1,800; August 29 --1,000; September 2--3,200; September 10--500.

What was believed to be a different population inhabited the adjacent Leach Lake in the following estimated numbers, viz.; August 12--2,500; August 13--3,700; August 18--3,000; August 25 --4,500; September 3--2,000.

In the early part of this period many of these mallards, perhaps the majority, were males in full eclipse, and their characteristic wariness while on open water influenced the entire flock so that it was not possible to approach them closely. Thus on August 13 while I was making a survey of Sirdar Lake by canoe, and mallards were in sight at all times, it was usual for a flock to rise at distances of 200 to 300 yards. Some flocks were in the shallows west and north of the Duck Creek outlet, some were on the weed beds far out on the lake, others were on the wide beaches.

So also at Leach Lake on August 15, a flock of 3,000 standing on a wide beach was much more nervous than the several hundred geese with which they associated. The mallards rose in three detachments, 10 minutes or so before the geese showed signs of uneasiness at sight of the approaching canoe.

A conspicuous feature on both lakes, noted first at Sirdar Lake on August 13, was the great quantities of shed duck feathers that whitened the waters. The individual feathers adhered to the emergent seed heads and surface foliation of pondweeds and other aquatics, or floated free with shaft erect and white filaments at the base conspicuous, so that all appeared white at a distance--like an efflorescense of Ranunculus. From a study of the feather collections it was possible to obtain some idea of the sex and age-groups of the visiting mallards. Thus at first all were mallard contour feathers, the majority identified as from adult females. Later appeared body feathers from the year's young, and on August 27 tertial eclipse feathers and contour feathers of males first were noted. Few feathers were dropped on the beaches, although many birds loafed there for hours at a time and eventually almost covered the ground with faeces.

After September 3, when the lake levels rose rapidly and covered much of the feeding grounds to a depth which did not permit the securing of food by dipping, the large flocks dispersed. At this time many birds were flushed from the horsetail marshes, the channels, and the ponds which began to form in the sedge meadows.

Observations in the summer of 1948 duplicated those of the previous years, the only difference being that the population was considerably smaller. The following counts indicate the difference in numbers: July 22--2; July 29--16; August 3--300±; August 11--1,200±; August 19--700±; August 21--525±; August 23--560±; August 27--600±.

August 9, 1947, was the first date on which mallards were seen on the wheat stubble. On the following morning at 8:00 a.m. 81 were counted in a pea field, and twice that many, in several flocks, passing overhead. In the next 2 hours flocks continually were flying back and forth between Leach Lake and the Reclamation. Later on in the month a large part of the population visited the fields morning and evening to feed on peas and grain.

The winter population has increased from an estimated 200 in 1946-1947 to 3,000 in 1947-1948. In this last winter the larger number may have been held by an unharvested crop of oats that remained in the field all winter.

Anas streperus Linnaeus. Gadwall.

At the south end of Kootenay Lake, August 29, 1947, a single male in flight was leading a flock of 8 shovellers; these passed me at a distance of approximately 35 yards. It is of interest to note that on the same date 1 year later a single male was seen at the same place by Mr. W. H. Ransom who was operating a banding trap there. Other records are: September 10, 1947, 2 males and 2 females flying in company with 50 or so green-winged teal; May 17, 1948, 2 males on a flood-pond near Leach Lake.

Anas acuta Linnaeus. Pintail.

Reported as a common transient in early Spring and observed as plentiful during the autumn migration. No evidence of nesting was obtained and I saw no pintails in summer. Mr. George Lines' estimate of numbers recorded in the spring of 1948 is as follows: March 10--500; March 21--50; April 16--150. This movement had terminated long before I arrived in the district on May 6, and personal observations were of small numbers only, viz.; May 15--5; May 17--8;

In the late summer of 1947 the first pintail, an adult female, was recorded on August 6; the following day a flock of 20 was observed and on August 12 approximately 50 were on Sirdar Lake. The majority were adult females in faded plumage, but with them was one group of 6 sleek, dark young. As so often is the case with post-breeding, adult pond ducks, these females were extremely wary, their behaviour contrasting with the relative fearlessness of the young. By August 26 the population inhabiting Sirdar Lake and the adjacent beaches of Kootenay Lake, had increased to approximately 500. This concentration comprised adult females, adult males fully eclipsed, and the year's young. The largest flock counted contained 120 individuals; usually the pintails were associated with mallards or baldpates or both. Sample counts taken subsequently are: September 2--600±; September 8-100±; September 10--400±.

The autumn migration of 1948 was of smaller volume as indicated by the following sample counts, viz.; August 11--100±; August 19--98; August 23--130; September 16--20.

Anas carolinensis Gmelin. Green-winged Teal.

The spring migration of green-winged teal was practically over when investigations on the Kootenay Flats commenced on May 6, 1948. Six late transients on the Kootenay Lake beach, May 10, and 2 at the same place the following day are the only personal records of observations for the spring period.

The extent, fluctuations, and time of the autumn migration as observed in 1947 and 1948 are indicated in the tabulation following:

1947		1948	
August	7--6	August	19--23
"	13--3	"	27--85
"	26--350	"	29--270
"	29--250	September	5--80
September	8--600	"	8--70
"	10--800		
"	11--350		

On August 18, 1947, a female with brood of 8 about three-quarters grown was noted on Summit Creek.

Anas discors Linnaeus. Blue-winged Teal.

There was suitable nesting habitat for this species on the reclaimed lands in 1947 and undoubtedly a few pairs nested there. One pair in a marsh-filled ditch on May 16, and an adult male in a similar place on May 22 constitute the spring records for that year. On Summit Creek, August 9, a single young bird, as yet unable to fly, retreated down stream in front of my canoe and on August 19 this bird or another accompanied a female and brood of green-winged teal. At various times from August 5 to September 2, flying young were recorded, as on August 16, when 12 accompanied a band of 30 mallards. Again on August 18, 4 came under close observation as they followed closely behind a flock of semi-palmated sandpipers, wheeling with them, rising, dropping again, as the restless sandpipers followed the shoreline of Leach Lake. A group of 4, probably a brood and more than usually fearless, was observed at close range in Duck Creek Channel on August 25 and August 29.

In 1948, 3 pairs were recorded May 16 on flood-ponds on the Reclamation before this area was submerged. None was seen throughout the summer's investigation.

Anas cyanoptera Vieillot. Cinnamon Teal.

Cinnamon teal were observed on four occasions as follows: May 22, 1947, 1 male on the margin of a flood-pond, and a pair swimming in a ditch on the Reclamation; May 16 to 18, 1948, a pair on the edge of a flood-pond, the male courting. These are the only records.

Mareca americana (Gmelin). Baldpate.

During May, 1948, small numbers of baldpates, chiefly in pairs, frequented shallow flood-ponds on the Kootenay Flats. There is no evidence that any remained to nest. Precise records are: May 10--2 pair; May 15--6 males and 2 females; May 17--2 pair. None was seen in the spring of 1947.

The first autumn migrants observed in 1947 were adult males in full eclipse, viz.; 4 on August 12, and 7 on August 25. These accompanied mallards or pintails. An invasion probably took place on the evening of that date as on the following day the population on Sirdar Lake and on the Kootenay Lake beach totalled 500±--the largest number recorded in one day. Another concentration occurred in early September and these later arrivals associated with coots which by that time had rafted on Sirdar Lake. Thus on September 10 20 of the 50 baldpates on the lake were scattered among the coots, and by the following day the entire baldpate population, which overnight had increased to 200±, was attached to the coot raft.

In 1948 the autumn migration parallelled that of the previous year. The first baldpates were observed on August 11--a flock of 20±, associated with a large flock of mallards on a flooded area of reclaimed land. Subsequent observations were made chiefly on the Kootenay Lake beach where numbers fluctuated to this degree, viz.; August 27--235, August 28--275; September 16--120.

Spatula clypeata (Linnaeus). Shoveller.

There is but one spring record for the species, viz.; May 10, 1948, when 6 males and 1 female were together on a permanent slough at West Creston, one on which floating leaves of manna grass and countless white blossoms of water-buttercup patterned the entire surface.

In 1947 the first autumn migrant was observed, attached to a flock of green-winged teal, at Sirdar Lake on August 7; the next observations, both on Leach Lake, being a flock of 9, August 12, and a flock of 23, August 18. The last were surface-feeding over a bed of *Potamogetons* several hundred yards from shore. On Sirdar Lake, August 28, a total of 40, including a flock of 25, was tallied. All these shovellers were gentle and unwary--so different in behaviour from the flocks of mallards and pintails that occupied the same waters. The migration appeared to reach its peak on August 29 when 100± were counted on the Kootenay Lake beach. The last record is of 20± on Sirdar Lake, September 20.

Shovellers were observed but once in 1948, viz.; August 24, when a flock of 17 visited a flooded area on the Reclamation.

Aix sponsa (Linnaeus). Wood Duck.

A population of wood ducks, estimated to be 40 to 50 pairs, nested on the Kootenay Flats in 1947 and 1948. From the accounts of local observers this number represents a norm that has fluctuated but little during the past 10 years.

On May 22, 1947, a pair in display flight through a flooded stand of cottonwoods was the earliest record for that year. Early records for 1948 are: May 6, 10 on a flood-pond at West Creston; May 10, 2 pairs standing a short distance apart on the Kootenay Lake beach, and a single female on an open pond in an adjacent cattail marsh where later a brood was raised.

During August of both years young birds were met with regularly on the sloughs and channels adjacent to Sirdar Lake. Members of a brood of 3 that came under observation on August 7, 1947, were about three-quarters grown. On these waters brood formation seemed to be lost early. Thus on August 16, 1947, a total of 20 flushed on Duck Creek Channel was made up of single birds, several couples, a trio, and one brood of 8. All were in flying condition.

As elsewhere in British Columbia wood ducks depart early in the autumn; the latest record is of 2 young shot on September 19, 1947.

Aythya americana (Eyton). Redhead.

Probably a regular spring transient. In 1947, 1 pair and 2 males together on a flooded meadow near Leach Lake, May 22, and a single female on a marsh-bordered slough near the International Boundary, May 23, were the sole records.

In the spring of 1948 the largest of several groups tallied consisted of 13 males and 3 females. They were on a flood-pond at West Creston on May 15. Three adult females were noted at the south end of Kootenay Lake on July 30, and on August 11 a flock of 90 adults visited a flooded area on the Reclamation. These last were very wary and once flushed left the pond in a body and, so far as could be determined, did not return.

Aythya collaris (Donovan). Ring-necked Duck.

Observed but once, viz.; at Sirdar Lake, September 8, 1947, when 4 males circled several times around a large raft of coots and then settled among them. Once the ducks passed my canoe within 40 yards providing a satisfactory opportunity for recognition.

Aythya valisineria (Wilson). Canvas-back.

On Sirdar Lake, August 14, 1948, I paddled close to an adult male canvas-back. This was the only one seen. Local observers inform me that a small migration occurs regularly through October and November.

Aythya marila (Linnaeus). Greater Scaup Duck.

Approximately 500 scaup ducks associated with rafts of diving ducks and coots several hundred yards from shore on Sirdar Lake, November 12, 1947, were identified as of this species.

Aythya affinis (Eyton). Lesser Scaup Duck.

Spring records in 1948 refer to a flock of 16 on a flood-pond near Leach Lake, May 10; a male and female together on Sirdar Lake, May 10, and a flock of 8 males and 2 females on a pond near Creston May 15 and 17. None was seen through the summer in either year.

On August 28, 1947, 3 females feeding with a flock of coots on Sirdar Lake came under observation, and at the same place, September 10, a flock of 40± passed overhead about 75 yards above the water.

Bucephala clangula (Linnaeus). Common Golden-eye.

In the spring of 1948 satisfactory identification of this species was possible on two occasions, viz.; on May 10 when 4 adult males together occupied a small flood-pond, and on May 11 when 2 females were watched feeding in a narrow drainage ditch. Observations of the last were made from a short distance, near enough to note the all-dark bill characteristic of yearling birds. A young male shot on Sirdar Lake, September 11, 1947, was examined in the flesh.

Bucephala islandica Gmelin. Barrow Golden-eye.

On May 11, 1947, a female and brood of 8, thought to be about 1 week old, were observed on a slough on the Kootenay Flats about 2 miles north of the International Boundary. This early date for young is notable. Assuming that a minimum of 10 days was taken to lay a clutch of eggs, that a 30 day incubation period followed, and that the young were 7 days old on May 11, this computation indicates that egg-laying commenced not later than March 22. In British Columbia pairs are still on their territories in mid-May, and it is unusual to find young on the water before the first week in June. Neither the brood referred to above, nor any other brood of small young, subsequently came under observation.

In 1948 a mated pair occupied a limited section of a drainage ditch alongside the main highway that traverses the Reclamation north and south, where the 2 were observed courting on each of several occasions the place was visited on May 6 and 7; on May 11 the male was alone on this territory but neither member of the pair was seen again.

Golden-eyes, chiefly young of the year, commenced to gather on Sirdar Lake and Leach Lake early in August. Undoubtedly these were migrants. Usually they were associated in flocks up to 30 and more, and commonly they did not allow a close approach. However, several times it became possible to obtain a close-up view of the bill-shape of individual birds--the only diagnostic character apparent at this season of the year. All thus examined were islandica, and thus the majority was assumed to be of this species.

The increase in numbers as the season advanced is indicated in the tabulation below:

1947		1948	
August	5-- 3	August	4--32
"	7-- 8	"	7--81
"	18--36	"	11--25
September	3--30	"	26--49
"	10--74	September	18-- 3

Bucephala albeola (Linnaeus). Buffle-head.

The only spring record obtained is of 1 pair, May 8, 1948.

The first autumn migrants were recorded in 1947 on August 15, and in 1948 on August 7. At no time was the species noted as common, the largest tally being 30, on Leach Lake, September 11, 1948.

Histrionicus histrionicus (Linnaeus). Harlequin Duck.

The only record is that of a male observed by Game Warden George Lines on Goat River, May 2, 1947.

Oxyura jamaicensis (Gmelin). Ruddy Duck.

Seen but once, viz.; an adult male, at the south end of Kootenay Lake, August 1, 1947.

Mergus merganser Linnaeus. American Merganser.

Observed on four occasions, viz.; a female flying down the Kootenay River, at a point near the International Boundary, May 10, 1947; 2 mated pairs on the south end of Leach Lake, May 10, 1948; 1 male on the Kootenay River, May 17, 1948; and 1 on Boundary Lake, August 21, 1949.

Lophodytes cucullatus (Linnaeus). Hooded Merganser.

Recorded but twice in spring, viz.; 1 pair, May 10, and a single female, May 17, 1948.

On August 5, 1947, an adult female accompanied by 3 full-grown young was seen on Leach Lake. Possibly these young were raised locally. There are numerous late summer records, the largest numbers seen together being 12 on September 10, 1947, and 8 on September 11, 1947.

Cathartes aura (Linnaeus). Turkey Vulture.

Near West Creston, September 5, 1947, 3 turkey vultures evidently migrating, were watched soaring in wide circles as they travelled south over the valley. This is the only record.

Accipiter gentilis (Linnaeus). Goshawk.

A young female goshawk was shot, September 5, 1947, from a thickly foliaged hemlock in the Corn Creek bottom. Near the same place, September 13, 1947, an adult male, attracted by an imitation of the pygmy owl call, flew directly towards me through an opening in the forest, travelling about 30 feet above the ground. Detecting my presence, it banked suddenly with wings thrust forward to climb abruptly and alight in a nearby dead larch where it remained long enough for binoculars to be focussed. A few minutes later the bird passed overhead and again alighted near the top of of a tall conifer.

Accipiter striatus Vieillot. Sharp-shinned Hawk.

Recorded once in spring, on May 14, 1947, and on 10 occasions during August and September. All those seen at close range were identified as young of the year. One of these, in flight along the edge of a shrubbery, was pursued by an eastern kingbird, another was seen to make an abortive attack on a red-shafted flicker. No evidence of the species nesting in the region was obtained.

Accipiter cooperii (Bonaparte). Cooper Hawk.

Five sight observations of this hawk are as follows, viz.; May 17, 1948, 1 in flight; August 14, 1947, 1 in flight over an apple orchard, a few feet above the tree tops; August 15, 1947, an adult male in flight; August 20, 1948, a young female on the bare limb of a tall Douglas fir; September 10, 1947, an adult female in a dead Douglas fir. An immature female in the worn plumage of the first year, shot at Sirdar, May 10, 1948, was examined by me.

Buteo jamaicensis (Gmelin). Red-tailed Hawk.

Adult red-tailed hawks were observed several times in May, soaring high over the open fields on the Kootenay Flats. The lateness of the records, viz.; May 22, 1947, May 12 and 19, 1948, and the fact that young birds were seen in the vicinity in early August, suggest that these were nesting. One possible nesting territory where both adults and young were seen or heard, was Drywash Canyon near the south end of Sirdar Lake; another was a logged-off hillside, near the International Boundary, surmounted by a fringe of tall timber. The crop and stomach of a young female collected on the Kootenay Flats, September 5, 1949, contained fragments of meadow mouse, Microtus pennsylvanicus, as the exclusive item.

Aquila chrysaëtos (Linnaeus). Golden Eagle.

On September 3, 1947, an adult golden eagle soaring over Leach Lake remained in sight for five minutes or longer. Its appearance put to flight several flocks of Canada geese that had been standing on the open shore, but the eagle seemed to pay no attention to them nor to other geese that remained on the beach.

Haliaeetus leucocephalus (Linnaeus). Bald Eagle.

At least one pair of bald eagles nested in the Creston region, the aerie being a tall cottonwood on the Kootenay River near Sirdar Lake. Here an adult accompanied by 2 full-grown young was seen August 13, 1947. Again the following year an identical family group was recorded at the same place on August 7.

Circus cyaneus (Linnaeus). Marsh Hawk.

The earliest record is of an adult male near West Creston, May 10, 1948. On May 19 and 20, 1948, a pair was observed in the vicinity of a bulrush marsh on an open meadow. Once the male, carrying a mouse in its claws, rose from the rushes, and shortly afterwards a female joined this bird in circular flight around the meadow. They acted in the manner of nesting birds; however, if they attempted to nest in the vicinity undoubtedly the nest was destroyed by the flood that reached its height about 10 days later.

In 1947 migrant young were seen a total of 10 times between August 11 and September 15, and in 1948 three times between August 7 and August 26. One adult male was recorded at Leach Lake, September 11, 1948.

Pandion haliaëtos (Linnaeus). Osprey.

Ospreys came under observation at Sirdar Lake and along the Kootenay River whenever these places were visited. Seven nests, probably in use each year, were counted, and likely there were others. Here, as elsewhere, the common site is the broken top of a tall, stout tree, usually a black cottonwood if on the river, or a conifer if on the mountain side. There were two exceptional sites, one being a crotch 30 feet from the top of an 80 foot cottonwood of which the upper third was dead and leafless, the other the combined tops of three dolphins lashed together, part of an abandoned wharf at Kootenay Landing. One brood of large young was still in the nest and attended by both parents as late as August 13, 1947. Single ospreys, whether adults or young was not determined, used nests as resting places, perhaps also as night-roosts, long after the young had been reared; one was doing so as late as September 20, 1948. Another, that on August 28, 1947, carried a trailing load of waterweed in a straight course over Sirdar Lake, evidently was engaged in repairing a nest.

Falco peregrinus Tunstall. Duck Hawk.

Recorded on the basis of two sight observations at the south end of Sirdar Lake; the first that of a young female, August 27, 1947, the second that of a young male, September 10, 1947. The female was seen first standing on the beach, and again in flight across a meadow. The male came flying swiftly along an open shore and, in passing, stopped once at a flock of pectoral sandpipers.

Falco columbarius Linnaeus. Pigeon Hawk.

Recorded numerous times in August, the majority being light-coloured birds.

F. c. suckleyi Ridgway. One example of this form was collected on August 19, 1947. It is a female, probably 1 year old, in full moult; the second primary in each wing is partly ensheathed, the remainder have recently been renewed; two new rectirces are black, crossed by three interrupted bars of a shade nearest to Drab-Gray, and by a terminal bar of Vinaceous-Buff (Ridgway colour standards and nomenclature).

The stomach contained adult dragonfly debris, exclusively.

F. c. bendirei Swan. Light-coloured pigeon hawks, all birds of the year, were recorded on the following dates, viz.; August 20, August 27, August 28, 1947; August 7, August 28, September 6, 1948. Several that came under close observation were harrying waders on the beaches of Sirdar Lake. Thus on August.27, 1947, a young female stooped at a flock of Baird sandpipers which dispersed in confused flight and a moment later it was in close pursuit of one member of the flock flying about 100 feet above the ground. Several times the 2 birds, twisting and turning along the circumference of a circle that narrowed and widened again, passed me within a few yards. Sometimes the pursuer momentarily gained on the pursued until a distance of 2 feet or less separated them; again, the distance between them lengthened. Twice the falcon climbed slightly to swoop, and miss, and lose ground, and then continue the dogged pursuit. The chase remained in view for about 5 minutes then both birds vanished behind a screen of willows. A few minutes later the falcon reappeared in straight flight across the meadow; so the chase, it was concluded, had failed.

Falco sparverius Linnaeus. Sparrow Hawk.

Sparrow hawks were recorded only twice in May and twice in July, an indication that the summer population is small. The same idea is expressed by Mailliard (6). Towards the end of August transients commenced to appear and through September 1 to 4 birds were seen almost daily.

On August 28, 1947, a female and brood of 3 young were in view for 20 minutes or so as they hunted food in a meadow alongside Sirdar Lake. Frequently one or another alighted on a small window, then dropped to the ground, and once one of the young ran awkwardly for several yards in pursuit of a grasshopper.

The earliest record is May 11, 1947, the latest September 24, 1948.

Dendragopus obscurus (Say). Blue Grouse.

Blue grouse were scarce in 1947 and only slightly less so in 1948 and 1949. During August and September of 1948, 2 females with small broods were encountered on the open slope of Drywash Mountain and 2 specimens, an adult female and a nearly full-grown young female, identified as Dendragopus obscurus richardsonii (Douglas), were collected.

Both these birds had been feeding on the berries of Oregon grape, and one had eaten a grasshopper.

Bonasa umbellus (Linnaeus). Ruffed Grouse.

Ruffed grouse were scarce both in 1947 and 1948, a total of 10 being seen. The one specimen collected, a young male in brown phase, September 22, 1948, can be matched closely with comparable specimens in my series from the Okanagan Valley and designated as Bonasa umbellus affinis Aldrich and Friedmann.

Perdix perdix (Linnaeus). European Partridge.

This is an immigrant, probably from the State of Idaho, occasionally seen on the Kootenay Flats in recent years.

Phasianus colchicus (Gmelin). Ring-necked Pheasant.

Introduced at some time prior to 1929 and now well-established on the Kootenay Flats and on adjacent foothills. The flood of 1948 destroyed the greater part of the population nesting on the flats, so that no open season for hunting was provided in that year's game regulations.

Porzana carolina (Linnaeus). Sora.

The unmistakeable call of this rail was heard on the Kootenay

Flats on August 4, 1947, and again on May 15, 1948. The lack of flood-free marsh habitat makes the region unsuitable for the species and it is doubtful that any nest there.

Fulica americana Gmelin. American Coot.

Noted chiefly as a transient, common in spring and abundant in autumn.

Each year a small number of coots nest, or attempt to nest, in round-stem bulrush marshes on the Indian Reserve south of Creston, although the area is undyked and subject to annual flooding. That in some years nests survive this hazard is testified to by Corporal Whittaker, who, on at least one occasion, saw downy young on these waters. In 1947 approximately 20 adults occupied the marsh on May 11, and on May 22 a pair, engaged in courtship display, was seen in an adjacent channel. On May 6 and May 10 scattered flocks, totalling $150^{\pm}$ and $200^{\pm}$, respectively, were scattered over about one-half-mile of water on Duck Creek Channel. None was seen after that date until August.

Migrating coots commence to appear on Sirdar Lake early in August and reach maximum numbers in early September. Invariably they associate in large flocks. In 1947 the first migrants, a flock of 40, were recorded on August 6. This flock, as well as one of 60, August 13, and a total of 58, August 16, appeared to be composed solely of adults, and all were extremely wary. In that year the first large flock, $1,000^{\pm}$, was noted August 26, but might have arrived several days earlier. In 1948 a flock of $700^{\pm}$ first appeared between 9:00 a.m. and 11:30 a.m. on September 8. When first sighted they were assembled in a long, narrow, and close-packed formation and when approached by canoe units of 100 or so rose in quick succession and left the lake.

Tallies for two years of the autumn migration are set out below.

1947		1948	
August	6-- 40	August	19-- 2
"	13-- 60	"	26-- 4
"	26--1,000	September	5-- 48
September	8--1,500	"	8-- 700
"	11--2,500	"	10--1,000
"	17--6,000	"	16--1,000

Whether or not any coots remain during the winter is not known. The last personal observation is of 4 large rafts on Sirdar Lake, November 12, 1947.

Charadrius hiaticula Linnaeus. Semipalmated Plover.

Observed once only, August 18, 1947, when a bird of the year was associated with a mixed flock of semipalmated sandpipers and Baird sandpipers on a mud flat at Leach Lake.

Charadrius vociferus (Linnaeus). Killdeer Plover.

A small population of killdeer plover inhabited the reclaimed areas in 1947 and probably nested there. None was seen in the spring of 1948.

The autumn wader migration of 1947 was notable for the numbers of killdeer plover concentrated on favourable beaches, for example a total of 90± scattered over an area of about 200 square yards on August 19. Such a large number of killdeer together has not hitherto been recorded in British Columbia so far as I am aware. The first transients, a flock of 12, another of 4, and a single bird, were recorded on August 13, the last, a group of 3, on September 13. Other tallies between these two dates are: August 10--80±; August 19--16; August 25--40±; August 26--28; September 11--12.

The autumn migration of 1948 was much smaller, 18 on August 24 being the largest count in one day. The first transients, 4 single birds, were noted August 11, the last, 2 single birds, on September 25.

Squatarola squatarola (Linnaeus). Black-bellied Plover.

At Sirdar Lake, September 2, 1947, the whistle of a black-bellied plover was plainly heard, and on September 8 at the same place 1 adult in summer plumage was observed near the end of a long, bare spit, where it was conspicuous among a flock of adult ring-bellied gulls and common terns.

Capella gallinago (Linnaeus). Wilson Snipe.

One or more was heard in nuptial flight several times in 1948 between May 9 and May 19, and on May 17, 1 was seen on top of a fence post beside a small marsh. If any of these snipe nested the nests were certainly destroyed by the spring flood. Other records are for the late summer of 1947, when a total of seven was recorded between August 4 and August 20.

Actitis macularia (Linnaeus). Spotted Sandpiper.

The only spring record is of 2 seen by Mr. C. Wilson, beside a flood-pond near Creston, May 15, 1948.

In 1947 spotted sandpipers were seen first on August 5 and subsequently became quite common. A count made August 13 during a complete circuit of the Sirdar Lake shore line totalled 18 young birds, and 1 adult in spotted plumage, presumably a male, accompanied by 2 flying young. As during the breeding season all suitable nesting habitat on the primitive portions of the Kootenay Flats are under water it is assumed that these birds, and others seen later, were transients. On August 13 a migration along Summit Creek was in progress, a total of 35, including one flock of 14, being tallied. The last, 4 single birds, were recorded on September 3.

In 1948 the migration was of small proportion, the first individual was noted, July 26, the last on September 12.

Tringa solitaria Wilson. Solitary Sandpiper.

Not observed in spring. From August 18 to August 25, 1947, a total of 8 was recorded. There was but one record for 1948, that of a single bird observed on the margin of a drainage ditch on August 11 and again the following day.

A specimen in the National Museum of Canada collected at West Creston, August 12, 1929, is identified as of the subspecies Tringa solitaria cinnamomea Brewster.

Totanus melanoleucus (Gmelin). Greater Yellow-legs.

There is one spring record, viz.; 2 observed by Mr. C. Wilson beside a flood-pond near Creston, April 3, 1948.

The autumn migration of 1947 took place between August 5, when 4 were observed, and August 29, when a single bird was noted. Between these dates a total of 51 individuals was counted, chiefly on the beaches of Sirdar Lake.

In 1948 Sirdar Lake and Leach Lake were less attractive to waders of all species than the reclaimed portion of the flats where, in the lowest places, residual water from the spring flood persisted until late August. The first greater yellow-legs, 2, were observed on one of these ponds, August 10; a flock of 10 was counted on Sirdar Lake, August 14; 2 were seen at Leach Lake, August 26; and most of the remainder on a pond close to Creston between September 16 and September 23. The peak of the migration was reached on September 22 when 25, the largest number seen in one day, were feeding along the shallow edge of this pond at 8:00 a.m. The total tallied during the migration was 82.

Totanus flavipes (Gmelin). Lesser Yellow-legs.

Not observed in spring. The earliest and latest dates for the autumn migrations are: August 5, September 8, 1947; August 7, September 23, 1948. In 1947 this species was more common than the last with which it usually associated; in 1948 the reverse was true. The details of migration are tabulated below.

	1947		
August	5--3	August	7--3
"	13--5	"	11--8
"	20--12	September	21--2
"	25--85	"	23--5
"	26--36		
"	27--60		
"	28--0		
"	29--2		
September	8--8		

The stomach of one specimen, collected September 8, 1947, contained fragments of approximately 34 Haliptus adults--the sole item. In another the fragments of 22 adults and 1 complete larva of Haliptus sp. were the chief item; 1 Chironomid larva also had been eaten.

Erolia melanotos (Vieillot). Pectoral Sandpiper.

The pectoral sandpiper was abundant during the autumn migration of 1947; the first to be noted, an adult male, was collected on August 25. Another adult, a female, was taken on September 3. Both are in worn, faded plumage, a condition making it possible to distinguish adults in the field from the much more abundant young. Actually adults of all migrating waders are exceedingly rare during the autumn flight through interior British Columbia. With some exceptions the few that have been collected were taken several weeks before the first wave of young appeared.

In the early afternoon of August 29 a flock of 70 pectoral sandpipers alighted in the shallows of Six Mile Lake, to occupy a position a few yards from where I stood on a slight elevation.

The light was unusually favourable so that counting the members of the flock proved an easy task, and each was scrutinized carefully. All wore the bright, first plumage characteristic of young birds. So also did all of numerous individuals examined closely at Sirdar Lake on September 10. This date saw the peak of the pectoral sandpiper movement. Flocks constantly came into view as I paddled along the lake shore, some in flight, some feeding along the margins of beaches, others partly hidden among shallow-flooded horsetail marshes. One group, numbering close to 200 and forming part of a larger flock, rose several times from a marsh of this type, barely clearing the tops of the horsetails then settling again a few yards distant. In flight the flock was remarkably compact, the wings of one bird seemingly all but touching the wings of its closest neighbour. The unison of movement--rising, dipping, and settling again--provided an unforgetable sight. As so often with flocks of young waders, these seemed without fear; many times they were watched from distances less than 14 feet. Flocks that came under close observation were estimated to consist of the following numbers, viz.; 350, 75, 60, 50, 40--a grand total of 575. On the following day the numbers on Sirdar Lake had decreased to 100±, and none was seen later.

There is one record only for 1948, that of 3 birds together at the edge of a flood-pond on September 7.

The stomach contents of one specimen consisted of small gastropods, *Helisoma subcrenatum*--69%; fragments of an adult terrestrial beetle, the elytra of 4 *Haliptus* adults and 1 complete *Haliptus* larva--4%; seeds of *Potamogeton pectinatus*, *P. richardsonii*, *P. pusillus* and *Scirpus acutus*--21%. The other specimens contained 60 chironomid adults--95%; corixid fragments--1%; and needle rush 4%.

Erolia bairdii Coues. Baird Sandpiper.

Baird sandpipers also were abundant in 1947. The migration commenced on August 12, when 3 were seen, and continued until September 10 when 5 were recorded. On August 28 it was the commonest sandpiper on Sirdar Lake, feeding on the beaches and in the inch-deep water 100 yards and more from shore, in flocks up to 90. Restless flocks alighted at the water's edge then spread out and became inconspicuous among the needle rush. Sometimes semipalmated sandpipers accompanied them and when flushed by a pigeon hawk--and this happened several times--the two species immediately separated, each flock flying out over the water high in the air where they wheeled about for 5 minutes or so then returned to the beach. In the air the difference in size between the two so similar in appearance, was more readily apparent than when the birds were scattered over the beach. On this day the larger flocks that came under review consisted of numbers estimated as follows: 90, 60, 50, 50, 30, that with numerous other smaller flocks added up to a grand total of 280. This proved to be the migration peak.

The only record for 1948 concerns some 300 birds which for 1 day, August 11, occupied a flooded stubble field, and a total of 9 seen on Sirdar Lake, August 18.

The chief food item in the stomachs of 2 specimens taken in September, 1947, was an aquatic beetle, *Haliptus* sp. One bird had eaten 11 adults, another 4 adults and 36 larvae that represented 50 and 80 per cent, respectively, of the total stomach contents. Fragments of 19 adult chironomids in one, and fragments of 4 in another stomach, represented 50 and 4 per cent, respectively, of the total volume. Two seeds of *Potamogeton pusillus* were present in one stomach.

Erolia minutilla (Vieillot). Least Sandpiper.

Recorded in autumn only. In 1947 a flock of 5 was noted on August 18, and thereafter until August 28 small flocks came under almost daily observation at Leach Lake or Sirdar Lake. The largest numbers counted were 6, August 25, and 30±, August 28.

There are two records for 1948, viz.; August 11, 5 on a flooded stubble field; August 28, 4 at Sirdar Lake.

Limnodromus griseus (Gmelin). Dowitcher.

At Sirdar Lake, September 8, 1947, a flock of 12 young accompanied by 6 lesser yellow-legs alighted at the edge of a beach and allowed me to paddle as close as 20 feet. All had uniformly long bills and presumably represented the subspecies *Limnodromus griseus scolopaceus* (Say). This is the only record of occurrence.

Ereunetes pusillus (Linnaeus). Semipalmated Sandpiper.

In 1947 this wader appeared first on August 12 when 3 were seen at Sirdar Lake in company with Baird sandpiper. On the following day 12, and on August 18, 30 were counted. The height of the migration was reached on August 28 when a total of 230 was tallied.

Often these sandpipers were associated with Baird sandpipers and upon alighting on the shore followed the larger birds from the beach-edge to the inner mudflats where needle rush formed a film of green on the otherwise bare ground. More often they fed along the extreme outer edge of the beach or in the water that, outward for 100 yards in some places, barely covered the lake bottom. It was quite easy, where the water was deep enough, to paddle within a few yards of them, and this was done frequently in the hope, that was not fulfilled, of detecting western sandpipers among them. The last, a flock of 20±, was observed on September 8.

Records for 1948 are: August 11--100 on flooded stubble; August 18--5; August 27--4, at Sirdar Lake.

Ereunetes mauri Cabanis. Western Sandpiper.

At Sirdar Lake, September 8, 1947, a western sandpiper, alone on a sandspit at the mouth of Duck Creek Channel, was collected; it proved to be a young female.

The stomach of this specimen contained fragments of 18± Haliptus adults, 30%; chironomid larvae, 39%; unidentified insect fragments including those of an adult aquatic beetle, 11%, and vegetable debris, including 4 seeds of Potamogeton pusillus, 20%.

Crocethia alba (Pallas). Sanderling.

At Sirdar Lake, September 10, 1947, a single sanderling, feeding along a narrow sandspit, ran into a flock of common terns that were resting there where it escaped detection until it, and the terns, rose together.

The following year, September 8, 1947, an adult female was collected on the same sandspit. The stomach of this specimen contained 2 Hyalella azteca and insect debris including Corixidae, adult Diptera, and aquatic coleoptera.

Steganopus tricolor Vieillot. Wilson Phalarope.

In the spring of 1948 1 to 3 Wilson phalaropes occupied a single flood-pond near Creston at intervals between May 8 and May 18. On May 15 Mr. C. Wilson counted a total of 9 on this pond and on several other similar ones.

The only additional record is that of a young bird that, on August 6, 1947, was observed wading in a shallow marsh near the outlet of Duck Lake 2.

Lobipes lobatus (Linnaeus). Northern Phalarope.

This phalarope was noted during the autumn migration only. In 1947 the first observation was of 3 birds on Leach Lake, September 12. At Sirdar Lake, September 10, a large flock estimated to number 75 was congregated about the edge of flooded horsetails at the lake margin, close to where large numbers of pectoral sandpipers were feeding. The third and last record for that year refers to 1 bird at Sirdar Lake, September 11.

In 1948 a flock of 40± visited a flooded stubble field and remained there that day only. The second and last record is of 4 together on Sirdar Lake, at the exact spot where the large flock had been seen the previous year.

Larus argentatus Pontoppidan. Herring Gull.

A single adult on Sirdar Lake, May 7, 1948, represents the only spring record. From July to September a small population made headquarters on a sandspit that extends into Kootenay Lake from the outlet of the Kootenay River. The majority that came under observation appeared to be fully adult; several wore the plumage of the second or third year, and 2 young of the year were recorded on July 29, and August 13, 1948.

From this resting place the gulls set out on frequent cruises along the shores of Kootenay Lake and Sirdar Lake, and some followed the course of the Kootenay River in their daily travels. The largest numbers counted in one day were 10 on August 15, 1947, and 7 on July 26, 1948. So far as known no herring gulls nest anywhere in the southern interior of British Columbia.

The subspecies is *Larus argentatus smithsonianus* Coues.

Larus californicus Lawrence. California Gull.

The sandspit referred to above was used constantly by California gulls. Six adults were identified there August 29, 1947, and on this date also a single bird was seen on Sirdar Lake. On July 30, 1948, a flock of 57 gulls on the spit included 20 adults and 8 young of this species. The last observations, September 12, were of 7 adults on the spit and 1 young on a sand bar in the Kootenay River.

Larus delawarensis Ord. Ring-billed Gull.

This was the common gull of the region, and present all summer. The sandspit on Kootenay Lake was visited at times but the main resting places and fishing grounds were on Sirdar Lake. In 1948 when flood water persisted on the cultivated parts of the flats these were visited frequently and flocks stood on the muddy margins for hours at a time. None was seen in spring but numbers were present on the dates I returned to Creston for the summer's work, viz.; August 4, 1947 and July 24, 1948. At all times adults were much more plentiful than young. Selected counts of adults are: 1947--August--54; August 18--28; August 28--40; September 10--100±. 1948--July 30--30; August 6--50; August 11--148; August 18--60; September 18--50. The earliest record for young is August 5, 1947, when a single bird appeared. Later in the month it was usual to see 4 or 5 accompanying the large flocks of adults. More arrived during September, the largest numbers counted in 1 day being 15, September 2, 1947, and 28, September 21, 1948.

On Sirdar Lake ring-billed gulls sometimes were seen fishing in the shallowest parts of the lake where lake shiners and the fry of suckers and large-mouthed black bass abound. More often the gulls were observed standing on the sand bars, particularly the long spit extending from the west side of Sirdar Lake mentioned earlier as a feeding ground for waders, and here several individuals usually were engaged in picking over the plant and animal debris that had accumulated on the beach.

The status of the ring-billed gull elsewhere in British Columbia is that of a fairly regular but not common transient. It is not known to nest within the boundaries of the Province. Actually the number of this species seen at Sirdar Lake is greater than the total of my observations in other parts of the Province over many years. The question as to where the Sirdar Lake population originates is one of much interest. Does it come from nesting grounds in the western United States or from some Alberta colony?

Evidently the adults go through a complete post-nuptial moult while on the Kootenay Flats. A male collected August 18, 1948, and a female taken August 28, 1947, have nearly completed this moult. In both specimens the tail is unmarked white, the top of the head streaked dusky. In the male the first and second primaries, still partly ensheathed, are 90 millimetres and 50 millimetres, respectively, shorter than the third primary. The first primary has a complete white mirror, in the second this mark is restricted to a small oval on the vane and a spot above the shaft. The bill is pale olive, with dusky sub-terminal bar, the gape orange, tarsi pale olive, iris pale olive-grey, and eyelids purple. In the female the first two primaries are just emerging from their sheaths, the bill is light cadmium with dusky sub-terminal bar, the gape vermilion, iris straw-colour, and tarsi greenish yellow. The stomach of one specimen contained the trunks of two large-mouthed black bass fingerlings; in the other stomach were two small suckers, the chief item; other food consisting of an adult diptera, a mayfly nymph, adult coleoptera fragments and mollusk debris.

Larus philadelphia Ord. Bonaparte Gull.

Young gulls of this species, as well as a smaller number of adults, were met with numerous times on Sirdar Lake and Leach Lake during the period of the autumn migration. The numbers observed changed from day to day indicating a progressing migratory movement.

In 1947 the first recorded appearance, 12 young, was on August 28. In 1948 the first were seen on August 7--again a flock of 12, of which several were moulting adults with black caps still conspicuous.

On September 8, 1947, 2 adults that accompanied 6 young were completely moulted to winter plumage. So also were 2 adults, also with 6 young, recorded September 11, 1948.

In 1947 Bonaparte gulls were present as late as November 13 when 35 were counted on Sirdar Lake. The proportion of young to adults in this flock was not determined.

Xema sabini (Sabine). Sabine Gull.

An adult female of this gull was collected from a beach at Sirdar Lake, August 28, 1947. This specimen is in worn nuptial plumage, the only sign of moult being on the head and throat where a few white feathers of the winter plumage appear. The bill is black with terminal third yellow ochre, gape bright vermillion, tarsi medium quaker drab, iris medium brown, eyelids dark red.

Insects, chiefly in fragments, constituted 90 per cent of the food in the stomach. The following items were identified: Odonata, 6± adult dragonflies; Zygoptera, 30± mayfly nymphs; Coleoptera, 1 Haliptus adult, 1 Dytiscus larva, 1 terrestrial beetle. Vegetable debris including needle rush made up the remainder of the stomach contents.

Sterna hirundo Linnaeus. Common Tern.

Adult common terns were first observed, at Sirdar Lake, on

August 28, 1947, and August 14, 1948. The species was most common in 1947 as the following counts indicate, viz.; September 2--30 adults; September 8--18 adults and 7 young; September 10--60 adults and 15 young; September 11--18 adults and 12 young. In 1948 a total of only 9 adults and 5 young were tallied between August 14 and September 10.

Common terns and ring-billed gulls used the same spit on Sirdar Lake, and the two species associated elsewhere along the lake shore. On September 10, 1947, the day on which the largest number of common terns was tallied, many terns, singly and in small groups, cruised along the shore. Now and again one hovered then swooped to the water in pursuit of a small fish. A flock of about 40, of which 7 were young birds, stood close together on the spit shining white in the sunlight--so much brighter than the ring-billed gulls standing near them. When disturbed the gulls rose and flew to a distant part of the lake, then the terns took wing in a body to wheel aloft in perfect unison of movement for a few minutes and then return to the beach. This they did a number of times, each flight seeming shorter than the last as the birds became more tolerant of the observers until finally they permitted an approach within 30 yards or less.

Three adults collected, August 28, September 8, September 10, 1947, are in worn nuptial plumage, one showing a freckling of white on the forehead.

The stomach of one specimen contained a small sucker 90 millimetres long, and in another was the trunk of a slightly larger sucker; in the third the contents were equally divided between insect debris and bones of small fishes including pharyngeal teeth of 2 lake shiners.

Chlidonias niger (Linnaeus). Black Tern.

At Sirdar Lake on September 10, 1947, 1 young tern of this species accompanied a flock of common terns on the sandspit. It remained there after the larger terns had flown and I was able to approach near to it. The same bird, or another similar one, was seen there again the following day.

Zenaidura macroura (Linnaeus). Mourning Dove.

Noted as a transient, first seen in spring May 18, 1947, May 10, 1948, and last recorded August 24, 1947 and August 25, 1948. Four, together, was the largest number seen in 1 day during these years. They were more plentiful during the autumn migration of

1949 when a total of 20 was recorded in the period August 18-20.

Bubo virginianus (Gmelin). Horned Owl.

Horned owls were seen or heard but rarely. On September 3, 1947, 1 was flushed from where it stood on the shore of Summit Creek. In 1948, 1 was flushed from open Douglas fir woods, August 21, and another in dark cedar woods at West Creston on September 21. An adult female, in moult, collected in a forest of cottonwoods at the south end of Kootenay Lake, July 26, is a typical example of the subspecies Bubo virginianus lagophonus (Oberholser).

Glaucidium gnoma Wagler. Pygmy Owl.

In 1948 the species was observed twice, at West Creston, September 5, September 13, 1947. Both responded to an imitation of the pygmy owl call and flew into trees close to where I stood. In 1949, 2 specimens were collected at West Creston, September 3, September 5, and 2 others were seen.

Asio flammeus (Pontoppidan). Short-eared Owl.

A single bird was seen at Nick's Island on the Kootenay Flats by Mr. Walter B. Johnstone, November 19, November 20, 1943.

Chordeiles minor (Forster). Nighthawk.

Nighthawks were observed on the autumn migration of 1947 between August 1 and August 26, and in 1948 between August 9 and September 16.

Chaetura vauxi (Townsend). Vaux Swift.

A single bird of this species was seen May 14, 1947, another on May 17, 1948, and 2 were recorded on July 26, 1948.

Archilochus alexandri Bourcier and Mulsant. Black-chinned Hummingbird.

A female black-chinned hummingbird was collected at Creston by Mailliard in 1928 (6). One was observed by Mr. C. Wilson in a flowering horse-chestnut, May 20, 1948. These are the only records known to me.

Selasphorus rufus (Gmelin). Rufous Hummingbird.

One adult male was recorded May 1, 1948, and young birds were seen numerous times from July 28 to August 22, 1948.

Stellula calliope (Gould). Calliope Hummingbird.

Two specimens, both males, were collected by Mailliard in 1928 (6); it was noted by Mr. C. Wilson at Creston, May 20, 1948, and recorded that year also near Sirdar on July 29.

Megaceryle alcyon (Linnaeus). Belted Kingfisher.

Observed numerous times during the summer on Duck Creek Channel and on the Kootenay River.

Colaptes cafer (Gmelin). Red-shafted Flicker.

The red-shafted flicker was noted as common on May 6, 1948, and subsequently it was seen or heard almost daily. During the first week of September in 1947, and a week or so later the following year, migrations of some volume came under observation. Thus on September 23, 1948, a flock of 12 was congregated on Sutcliffe Point.

Specimens are typical of the subspecies Colaptes cafer cafer (Gmelin). None shows any of the ordinary indications of intergraduation with Colaptes auratus.

Dryocopus pileatus (Linnaeus). Pileated Woodpecker.

This woodpecker was seen or heard at least a dozen times and large nesting holes in cottonwoods along the Kootenay River were attributed to it. At West Creston, September 20, 1948, 1 that was excited by the imitation of the pygmy owl's call alighted in a low bush about 8 feet from where I sat concealed.

Asyndesmus lewis (Gray). Lewis Woodpecker.

Observed on three occasions, at Nick's Island on the Kootenay Flats, viz.; May 21, 1947, May 15, 1948, August 10, 1948. From Mailliard's account (6) may be inferred that in 1928 this woodpecker was more plentiful locally.

Sphyraphicus varius (Linnaeus). Yellow-bellied Sapsucker.

This species was fairly common, more so in the woods at West Creston and in the cottonwoods on the Kootenay Flats than elsewhere. The earliest record is May 7, 1948. A brood of young in first plumage occupied a willow thicket near Sirdar Lake, July 29, 1948, and subsequently young in various stages of moult were met with frequently. The last was observed on September 23, 1948.

Specimens collected are of the race Sphyrapicus varius nuchalis Baird.

Dendrocopos villosus (Linnaeus). Hairy Woodpecker.

Hairy woodpeckers were seen occasionally in the deciduous woods on the Kootenay Flats and in a burn on Drywash Mountain. In the latter habitat a young male moulting from the juvenile plumage was collected on August 5, 1948. The subspecies is Dendrocopos villosus monticola Anthony.

Dendrocopos pubescens (Linnaeus). Downy Woodpecker.

A mated pair was observed in a tall cottonwood on the Kootenay Flats, May 22, 1947, and numerous other sight records were made later. On August 25 of the same year a male was watched for 10 minutes or so as it worked on the seed heads of mullens Verbascum Thapsus L. growing by the roadside. It flew from one plant to another evidently finding larvae of some kind.

The subspecies is Dendrocopos pubescens leucurus (Hartlaub).

Picoides arcticus (Swainson). Arctic three-toed Woodpecker.

A family party of this woodpecker, consisting of an adult female and three full-grown young, was seen several times in a group of dead larch on Drywash Mountain, and specimens were taken there on August 5, 1948. None was observed elsewhere.

Picoides tridactylus (Linnaeus). American three-toed Woodpecker.

One seen in Boundary Valley, August 21, 1949, is the only record.

Tyrannus tyrannus (Linnaeus). Eastern Kingbird.

Common along the margins of the Kootenay Flats, the earliest record May 17, 1948, the last, August 29, 1947, August 26, 1948.

Tyrannus verticalis Say. Western Kingbird.

This kingbird was seen at the same place on the Kootenay Flats on May 21, 1947, and again on May 17, 1948. Another was recorded on the edge of the flats, near the International Boundary, on May 23, 1947.

Empidonax hammondi (Xantus). Hammond Flycatcher.

Small flycatchers, which might have been either this species or the next, were seen occasionally in May, 1947, and in August of both years.

There are two specimen records, viz.; 1 taken at Creston by Mailliard (6), May 7, 1928, the other, a female in first-winter plumage, collected at Sirdar, August 17, 1948.

Empidonax wrightii Baird. Wright Flycatcher.

Two specimen records, viz.; May 19, 1928 (6) and September 13, 1947; the last, a female in first-winter plumage, was collected at West Creston.

Contopus richardsonii Swainson. Western Wood Pewee.

Seen or heard in numerous places from July 26 to August 25, 1948. There is one late record, viz.; September 7, 1948.

Nuttallornis borealis (Swainson). Olive-sided Flycatcher.

Observed several times on Drywash Mountain from August 5 to August 17, 1948. One specimen was taken.

Eremophila alpestris Brehm. Horned Lark.

Four horned larks accompanied a flock of about 20 pipits on a mudbeach at Sirdar Lake, September 8, 1947. Again on September 18, 1948, four visited the same beach. No others were seen.

Specimens taken, one from each of these flocks, are typical of Eremophile alpestris arcticola Oberholser.

Tachycineta thalassina (Swainson). Violet-green Swallow.

Reported by Mailliard (6) as common in Creston on May 1, 1928, and nesting in dead trees on the river bottom as well as in a lumber yard in town. This swallow was not conspicuously common in 1948 except at times during the autumn migration. Thus on August 5, 1947, all the numerous white-bellied birds among a flock of 200 swallows that alighted close to me on a mud flat at Sirdar Lake were identified as young of this species.

Iridoprocne bicolor (Vieillot). Tree Swallow.

A common summer visitant seen almost daily. On August 20, 1947, some 50 individuals, considered to be transients, were seen circling about a flood-pond. A single bird was recorded the following day; none was seen subsequently.

Riparia riparia (Linnaeus). Bank Swallow.

The bank swallow was common through summer and during the autumn migration, for example, on August 15, 1947, when a flock numbering 200± kept alighting on the bare top of a dyke on the Kootenay Flats near Creston. In 1948 a colony excavated approximately 150 nests in a sand bank directly behind, and about 20 feet from a fruit-packing plant at Wynndel.

Stelgidopteryx ruficollis (Vieillot). Rough-winged Swallow.

This swallow was not found nesting although it may do so. Two were seen on Summit Creek, May 10, 1948, and near Sirdar Lake, July 31, several broods of 3 and 4 young were resting in dead willows along the Duck Creek Channel. On August 4, 1947, 20 or more were counted on the Kootenay Flats near Creston. Others were seen August 5 and August 15 with a flock of young tree swallows and a flock of bank swallows.

Hirundo rustica Linnaeus. Barn Swallow.

Observed first in 1948 on May 8 and on May 10. The species was reported to have nested "about Creston" in 1928 (6), and probably does so still. It was common during the autumn migration, more so in 1947 and in 1948. On August 15 of the first year approximately 40 were watched as they circled over the meadow, or alighted among round-stem bulrushed to which they clung for for several minutes at a time.

In 1947 the last was recorded on September 1, but the following year 1 or 2 were seen almost daily well into that month, the last, 2, being recorded on September 22.

Petrochelidon pyrrhonata (Vieillot). Cliff Swallow.

This swallow nested at Creston in 1928 (6) but was seen by me on the autumn migration only. On August 5, 1947, 1 was conspicuous on a mud flat among young violet-green swallows, and on August 15 several accompanied migrating bank swallows. In 1948 it was seen once, August 20, when a migrating flock of 20± young flew about a flood-pond and alighted on the wires of a nearby fence.

Perisoreus canadensis (Linnaeus). Canada Jay.

On September 5, 1947, a band of 3, another of 4, were found in the dense second growth conifers at West Creston, and specimens were taken.

This jay was not observed in the more open and dry woods on the east side of the Kootenay River; however, there is a nesting record for Arrow Mountain, March, 1926. Mr. Gordon Stace-Smith told me that in early March he found a nest and five eggs of the Canada jay situated about 10 feet above ground in a small lodgepole pine; the precise locality being directly below the main tailings dump of the Alice mine at an approximate altitude of 3,500 feet. Mr. Stace-Smith said that on each of several times he visited the scene both birds were on the nest, and on one occasion a third jay accompanied them.

The subspecies represented is *Perisoreus canadensis bicolor* Miller (7).

Cyanocitta stelleri (Gmelin). Steller Jay.

A pair was seen on the east side of Kootenay River near Sirdar on May 7, 1948, this being the only spring record. On the west side of the river the species was observed frequently during early September, the largest count being 12 on September 12, 1947. It was noted on the west side also at this time, but less often and in smaller numbers. In winter, however, so local observers state, it becomes conspicuous about Creston and the vicinity.

Five specimens in fresh autumn plumage were collected. These differ in appearance from a comparable series taken at several Okanagan Valley points in being more blue, less brownish, on the dorsal surface. They are nearest to Bluish Slate-Black while the same area in most Okanagan specimens is between Chaetura-Drab and Chaetura-Black. They differ also in having head and crest more definitely black. The specimen most closely resembling the Creston series, in a total of 70 Cyanocitta stelleri examined, is a female from Lake Louise, Alberta. I have not examined topo-typical material of Cyanocitta stelleri annectens Baird but as the population being considered inhabits territory much closer to the type locality of annectens than does the Okanagan population it may be inferred that the first is more nearly typical of this race.

Pica pica (Linnaeus). Black-billed Magpie.

No magpies were seen in either year. On the authority of statements by several local farmers it is included here as a more or less regular winter visitant appearing in late autumn, usually before the first snowfall.

Corvus corax Linnaeus. Raven.

A raven was observed in flight along the edge of the Reclamation near Wynndel on May 18, 1948, and again on the following day. During August and September 1 or 2 were seen or heard a number of times.

Corvus brachyrhynchos Brehm. American Crow.

Crows were not conspicuously plentiful during May, the largest count being 15, on May 10, 1948. Two nests of typical construction, containing 4 and 5 eggs, respectively, on May 11, 1948, were in dead willows standing on a point that extends into Sirdar Lake near the south end--an area submerged to a depth of 6 feet and more during the spring flood. One female did not leave the nest until I stood directly beneath it.

A flock of 100 flying south high in the air on August 7, another of 75, September 17, circling over a stand of tall Douglas fir where no doubt they roosted, and a flock of 100± scattered over a new ploughing, and flying from one part to another, were considered to be transients.

Nucifraga columbiana (Wilson). Clark Nutcracker.

Clark crows were seen, or heard, on Drywash Mountain each day this area was visited during August and September of both years. This population consisted of not more than 4 or 5 individuals that perhaps comprised a pair and its full grown young.

Parus atricapillus Linnaeus. Black-capped Chickadee.

A common resident. Several of a group of 20± examined at close range, August 16, 1947, were young still carrying filaments of down on the head. Perhaps the largest population inhabit the second growth conifer woods on the west side of the river. None was seen in the cottonwoods on the Kootenay Flats until September.

Critical examination of 8 freshly moulted specimens has convinced me that in size and colouration these are practically identical with the populations inhabiting other parts of southern and central British Columbia to which the name Parus atricapillus septentrionalis Harris is currently applied.

Parus gambeli Ridgway. Mountain Chickadee.

In British Columbia the mountain chickadee frequents a variety of habitats, including the yellow pine-Douglas fir association of the Dry Forest Biotic Area, the aspen-Douglas fir association of the Cariboo Parklands Biotic Area, and open woods near timberline in the Alpine Forest Biotic Area. Although what would seem to be equally suitable environment is common about Creston this chickadee was not recorded anywhere in intensively explored territory on both sides of the Kootenay Flats. It was not until I visited the Boundary Creek Valley that the species was found. Here it was common, occupying the same habitat as, and sometimes associating with, the Hudsonian chickadee and chestnut-backed chickadee.

All three species appear to have been modified in depth of colour by the factors of dense shade and relatively high precipitation. Thus a male and a female of Parus gambeli, with fully granulated skulls, collected near Boundary Lake on August 21, 1949, are noted as slightly darker on the back than any in series from the Dry Forest and Cariboo Parklands Biotic Areas.

Parus hudsonicus. Forster. Hudsonian Chickadee.

Found only in the Boundary Creek Valley where it was common, for the most part keeping to the tops of the tall conifers.

Three specimens collected, male adult, female adult, and young female in moult, represent the subspecies Parus hudsonicus cascadensis Miller.

Parus rufescens Townsend. Chestnut-backed Chickadee.

Recorded at West Creston and at Boundary Lake. The preferred habitat appears to be dark woods of giant cedar and western hemlock.

Three adult males and 1 adult female in fresh autumn plumage, collected at West Creston, are different in colouration from P. r. rufescens as represented on the coast of British Columbia, and in the Monashee Range of the interior. They have been compared with a total of 27 specimens from the following localities, viz.; southern Vancouver Island, Departure Bay, McClinton Creek on Graham Island, Lakelse Lake, Taft, and Rawlings Lake.

It might be expected that the population inhabiting the deep spruce woods near the west coast of Graham Island, where the average annual precipitation is 100+ inches, would be darker than the population inhabiting the open woodlands of southern Vancouver Island, where the average annual precipitation is 26+ inches. But such is not the case. Specimens from all the localities noted are surprisingly uniform in colouration. The most richly coloured are the West Creston birds. They differ from all others in having a decidedly darker cap, nearest to Fuscous-Black, and in the richer shade of chestnut on flanks and back.

It would seem likely that the West Creston specimens represent an unrecognized subspecies which occupies the giant cedar and hemlock association of the Columbia Forest Biotic Area in southern British Columbia and northern Idaho. However, a decision needs to be postponed until an adequate series of specimens becomes available.

Sitta canadensis Linnaeus. Red-breasted Nuthatch.

Seen only in conifer forests. So much of the original forest-cover about Creston has been removed that relatively little suitable habitat for the species remains except on the west side of the river. Here the red-breasted nuthatch was noted as relatively abundant on September 5, 1947.

Certhia familiaris Linnaeus. Brown Creeper.

One record only, viz.; a young female in moult collected in the Boundary Creek Valley on August 21, 1949.

The subspecies is Certhia familiaris montana Ridgway.

Cinclus mexicanus Swainson. Dipper.

One was seen on Duck Creek, where the stream flows rapidly down a steep canyon, on September 13, 1948. This is the only personal record but I was informed that water ouzels frequently are seen along the Goat River.

Troglodytes aëdon Vieillot. House Wren.

A relatively scarce summer visitant becoming much more plentiful during the autumn migration when many frequented the logged-off slopes of Drywash Mountain. Six were seen there August 6, 1948, and twice that number on August 9 when specimens were collected. These were young moulting to first-winter plumage. Another, collected August 20, is still in the spotted juvenile plumage. The last was recorded on September 6, 1948.

Troglodytes troglodytes Linnaeus. Winter Wren.

One was seen at West Creston, September 13, 1947, was the only record for that year. In 1948 it was recorded on four occasions from August 6 to September 12, the first 3 at about 3,000 feet altitude on Drywash Mountain, the last in the Corn Creek bottom on the west side of the Kootenay River. One specimen was collected at West Creston on September 5, 1949.

Dumetella carolinensis (Linnaeus). Catbird.

A common summer visitant to lower slopes along the Kootenay Flats. Full-grown young were watched feeding on mulberries on July 29 and subsequently until August 2, 1948. On August 22, 1 young bird in juvenile plumage, and not fully grown, was collected on Drywash Mountain. This young bird was alone and obviously migrating. The latest date on which a catbird was seen in September 8, 1947.

Turdus migratorius Linnaeus. American Robin.

Noted as plentiful at Creston on May 8, 1948; 1 was observed carrying nesting material and the majority was paired.

The autumn migration came under more careful scrutiny. Several mulberry trees loaded with fruit proved a potent attraction to robins and the numbers visiting them was a useful index to the migratory movement of the local population. Thus from July 26 to August 2, 1948, many young, some in faded juvenile plumage, others in various stages of transition to first-winter plumage, fed continually on this fruit, and the numbers fluctuated from day to day. By August 14 robins had become scarce and several days passed with none being seen. Subsequently the mulberries, although still abundant, no longer attracted passing flocks. Rather these concentrated on Sutcliffe Point and there fed on an abundant crop of black haws and choke cherries. Here on August 20 I counted 80 robins, and on each of the succeeding days this place was visited, until September 24, the migratory movement continued. On September 7 robins seemed eager for food, as if hungry after a long journey, and kept flying into the low hawthorns while I stood within a few feet of them. On September 23 a flock of 30 or more moved in short flights through the trees and shrubbery as I walked slowly behind them. Reaching the end of the point they flew out over the plain, then rose high in the air to join a flock of 100+ robins flying southeast. This was a cold, cloudy day with a strong southerly wind blowing up the valley.

Possibly there was some segregation of sexes in these flocks. At any rate all that came under close scrutiny on September 7 were females, as were 4 specimens collected on that date. Conversely on September 23 all appeared to be males as were the 3 collected. Of the total of 7 specimens collected during this migration all but 1 were young of the year recently moulted to first-winter plumage.

T. m. migratorius Linnaeus.

Two females, both birds of the year, collected on migration, September 7, September 16, 1948, are considered to be examples of this race.

T. m. propinquus Ridgway.

This is the subspecies nesting in the region. One adult male, and 7 specimens representing young of various ages, are of this race.

Ixoreus naevius (Gmelin). Varied Thrush.

On September 3, 1949, at West Creston, I collected a juvenile female, and a young female moulting to first-winter plumage. In addition to these records are two observations of the species, viz.; a young bird feeding on mulberries, August 21, 1947, and 1 adult seen in thick woods in Duck Creek Canyon, September 16, 1948. Mailliard (6) collected specimens at West Creston, May 11, 1928, and established a breeding record by locating parents and fledglings near Creston on May 27.

The subspecies is *Ixoreus naevius meruloides* (Swainson).

Hylocichla guttata (Pallas). Hermit Thrush.

A juvenile female in spotted plumage was collected at a place close to the valley floor on each of the following dates, viz.; July 29, August 12, 1948. Both had been feeding on mulberries. The age of the young suggests their place of origin to be not far distant, perhaps on the summit country directly east of the Kootenay Flats.

The subspecies represented is *Hylocichla guttata oromela* Oberholser.

Hylocichla ustulata (Nuttall). Swainson Thrush.

A common summer visitant. In 1948 the first was seen on May 19 and 2 days later it became common. From July 29 to August 12, 1948, young birds were constant visitors to the mulberry trees. Those first noted, members of 2 broods, were in juvenile plumage. A specimen collected August 12, 1948, is about half-way through the moult to first-winter plumage.

The subspecies is *Hylocichla ustulata almae* Oberholser.

Hylocichla fuscescens Stephens. Veery.

There are two sight records for the species, viz.; July 29, August 2, 1948. Both birds were observed in a mulberry tree.

Sialia mexicana Swainson. Western Bluebird.

Observed on only 2 occasions, viz.; 1 adult male near Sirdar, May 20, 1947, and a pair on Sutcliffe Point, May 15, 1948. Mr. Charles Nelson of Sirdar told me that a few western bluebirds visited his garden in January, 1947, and spent the nights in several bird houses. This species winters frequently in the Okanagan Valley.

Sialia currucoides (Bechstein). Mountain Bluebird.

The mountain bluebird, both in 1947 and 1948, appeared to be much less common in the Creston region than in other British Columbia valleys. The annual flooding of the primitive parts of the Kootenay Flats that otherwise would provide suitable nesting territories, the scarcity of trees with nesting holes on the reclaimed lands, and the high cultivation of the bench lands, greatly reduces the amount of habitat suitable to this species.

Several broods of young in first plumage were seen late in the season, viz.; August 4, August 14, 1947, and 2 closely observed on August 19, 1948, had attained first-winter plumage. The September migration of mountain bluebirds, so vivid a picture along many British Columbia country roads, was hardly noticeable here, the largest numbers counted in one day being 10 on September 5, 1947, and 7 on September 13, 1948. The latest record is of 1 male, September 23, 1948.

Myadestes townsendi (Audubon). Townsend Solitaire.

There is but one record. On September 3, 1949, while travelling by car up Boundary Creek Valley, a Townsend solitaire was plainly seen as it flew across the road a few yards in front of the car.

Regulus satrapa Lichtenstein. Golden-crowned Kinglet.

From August through September golden-crowned kinglets in bands up to 10 and more were found in association with black-capped chickadees in coniferous woods on Arrow Mountain and at West Creston. None was recorded earlier in the season.

Regulus calendula (Linnaeus). Ruby-crowned Kinglet.

Noted as common, and singing, near Creston on May 12, 1947, but not recorded in spring of the following year. The species became fairly common, September 5, 1947, September 20, 1948. The last, 3, were recorded September 24, 1948.

An adult male freshly moulted, September 23, 1948, can be matched exactly with specimens of *Regulus calendula calendula* (Linnaeus) from Ontario.

Anthus spinoletta (Linnaeus). Alpine Pipit.

Observed only on the autumn migration and as follows: September 2, 1947--6; September 8, 1947--30±; September 8, 1948--20±; September 18, 1948--4. All were on, or in flight over, the south beach of Sirdar Lake.

Bombycilla cedrorum Vieillot. Cedar Waxwing.

During August and September adult cedar waxwings were seen numerous times, usually while they were feeding on mulberries or choke cherries. As elsewhere it is a late nester, and the earliest record of flying young was August 23, 1948. Young still in juvenile plumage were observed as late as September 10, 1948, and September 15, 1947. The largest number, adults and young, tallied in one day was 20±, August 20, 1948; these were feeding on choke cherries at Sutcliffe Point.

Vireo solitarius (Wilson). Solitary Vireo.

Reported by Mailliard (6) to be not at all numerous about Creston; this describes the species' status as observed in 1947 and 1948. The earliest record is May 8, 1948, and there are but 2 autumn records, viz.; August 23, 1947, when 4 or 5 together, possibly a brood, were noted near the Goat River, and August 16, 1948, when one was seen on Arrow Mountain. All were frequenting second growth conifer thickets.

The subspecies is *Vireo solitarius cassinii* Xantus.

Vireo olivaceus Linnaeus. Red-eyed Vireo.

This is the common vireo of the district and, as elsewhere in British Columbia, one of the latest summer visitants to arrive in spring. In 1948 the first was noted, May 20. It was a regular visitor to the mulberry trees from late July through August and was also seen eating choke cherries. The characteristic song was heard last, August 13, 1948. Young in first-winter plumage were collected August 25, 1947, August 18, 1948. In 1947 a considerable migration took place between August 18 and August 26 when more than the usual numbers frequented willow and alder thickets at several places on the Kootenay Flats. The latest observation date is September 3, 1947.

Vireo gilvus (Vieillot). Warbling Vireo.

At no place in summer was this vireo noted as plentiful; the earliest record is May 21, 1948. It became relatively more numerous during the autumn migration when both this species and the last frequented brushy thickets and stands of cottonwood on the Kootenay Flats. A total of 10 was counted in this type of habitat on August 19, 1947. The latest observation record is September 3, 1947.

The subspecies is Vireo gilvus swainsonii Baird.

Vermivora celata (Say). Orange-crowned Warbler.

Recorded only during the autumn migration, and on five occasions only, viz.; August 19, September 15, 1947; July 29, August 20, August 22, 1948. The one specimen taken, a male in first-winter plumage, is identified as Vermivora celata orestera Oberholser.

Vermivora ruficapilla (Wilson). Nashville Warbler.

Males sang continually from the tops of second-growth larches near Creston in the evening of May 8, 1948, and were seen and heard there subsequently for several days. A young female, taken August 17, 1948, is fully moulted to first-winter plumage and an adult male, taken August 23, 1947, is in fresh autumn plumage. The last represents the latest record.

The subspecies is Vermivora ruficapilla ridgwayi van Rossem.

Dendroica petechia (Linnaeus). Yellow Warbler.

This is the most common of the local nesting warblers. The earliest records are for singing males on May 16 and 17, 1948. A young male in first-winter plumage was taken July 29, 1948, and numerous others were recorded in the following weeks until August 21. This warbler frequently was seen eating mulberries.

The subspecies is Dendroica petechia petechia Linnaeus.

Dendroica coronata Linnaeus. Myrtle Warbler.

There is but one record, viz.; a male in first-winter plumage collected at Sutcliffe Point, September 24, 1948. This bird accompanied 4 Audubon warblers.

Dendroica auduboni (Townsend). Audubon Warbler.

Several males were seen, and heard singing, in second-growth larch near Creston from May 7 to 9, 1948. However, these did not exhibit territorial behaviour and soon afterwards disappeared. Apparently this warbler does not nest on the Kootenay Flats nor on the immediately adjacent lowlands, but rather on the higher slopes above the valley. Broods of young in juvenile plumage were found on Drywash Mountain, August 5, 6, 1948, and young in first-winter plumage on Arrow Mountain, August 11.

From August 12 to 27, 1947, a migration took place along the Kootenay Flats but in the following year it was not until September 6 that the species became common. These passing groups consisted mainly of young in various stages of moult to first-winter plumage. The latest records are September 15, 1947; September 24, 1948.

The subspecies is *Dendroica auduboni auduboni* (Townsend).

Seiurus noveboracensis (Gmelin). Northern Water Thrush.

On May 21, 1947, 1 was seen, and heard singing, in thick brush beside Goat River Slough, and on August 10, 1948, 1 was heard near the same place. A specimen collected in a willow thicket beside the Duck Creek Channel, August 3, 1948, is a female in first-winter plumage.

The subspecies is *Seiurus noveboracensis notabilis* Ridgway.

Oporornis tolmiei (Townsend). Macgillivray Warbler.

One observed May 17, 1948, is the only personal spring record. Mr. C. Wilson found a nest containing young in a thicket beside the railroad track about 2 miles east of Creston on June 20, 1948. Very likely the species nests in the shrubberies of the lower mountain slopes, for example on Drywash Mountain where a brood of young in first-winter plumage was found, August 5, 6, 1948. Later in the month a migratory movement took place through the same territory, the peak being August 22 when 10 were counted there. The latest record is September 3, 1947.

Geothlypis trichas (Linnaeus). Yellow-throat.

Probably rare in spring as it was seen only once at that season, viz.; May 17, 1948. There is no suitable nesting habitat for this warbler on the unreclaimed portions of Kootenay Flats as all marshes and shrubberies are annually flooded. Whether or not it nests along the dykes through the reclaimed lands could not be determined as these, too, were flooded in 1948, as has been noted.

Yellow-throats, chiefly young, became quite abundant in August, both in mountain-side shrubberies and in willow thickets on the flats. Two juvenile males, taken August 2, 1948, are moulting to first-winter plumage; another, August 19, has completed this moult. With one exception those subsequently noted were in first-winter plumage. The exception is an adult male in the early stages of moult to winter plumage, collected August 14, 1948. In this specimen the new tertials are ensheatned and new sheathed feathers appear on the occipital region; the new feathers of the lateral-ventral tracts are a rich shade nearest to Isabella Colour, the parallel lines quite conspicuous against the otherwise yellow surface.

The largest number of yellow-throats passed through in early September, the latest dates being September 15, 1947, and September 13, 1948.

The subspecies is Geothlypis trichas occidentalis Brewster.

Wilsonia pusilla (Wilson). Black-capped Warbler.

Observed on only two occasions, viz.; August 18, 1947, when 3 were identified among other migrating warblers that frequented a riparian thicket of willows along Summit Creek, and on August 9, 1948, when 1 was seen in a shrubbery near the base of Drywash Mountain.

Setophaga ruticilla (Linnaeus). American Redstart.

Scarce in spring but relatively abundant during the autumn migration. Mailliard (6) reports collecting 1 near Creston on May 28, 1928, and 1 was observed by me in the same locality on May 19, 1948. Redstarts were seen frequently in deciduous woods and thickets from August 18 to September 3 in 1947, and from August 2 to August 24 in 1948. Excepting 2 adult males, freshly moulted, August 12, August 18, and an adult female collected August 2, all that came under close observation appeared to be young in, or moulting to, first-winter plumage.

On three occasions 1 or more redstarts were observed feeding on mulberries.

Passer domesticus (Linnaeus). English Sparrow.

An abundant resident in Creston, in Wynndel, and about some of the farms in the vicinity. Broods of flying young appeared as early as May 12, 1947.

Dolichonyx oryzivorus (Linnaeus). Bobolink.

Observed by Mailliard, May 28, 1928, and by C. Wilson, May 24, 1948. On August 10, 1948, a flock of 20 consisting of both adults and young were found feeding on half-ripened oats on Nick's Island. Two specimens were secured.

Sturnella neglecta Audubon. Western Meadowlark.

On May 8, 1948, numerous males were singing continually on the Kootenay Flats but none nested there successfully, and the birds left as the flood waters rose. The first transient was observed August 25, others appeared in the weeks following but at no time did it become numerous. One was heard singing freely near Sutcliffe Point from September 21 to 24, 1948.

Xanthocephalus xanthocephalus (Bonaparte). Yellow-headed Blackbird.

Observed on migration only. On May 17, 1948, 2 females accompanied several cowbirds that were in attendance on horses in an enclosure on the Kootenay Flats. On August 5, 1947, a flock of 16, chiefly moulting young, alighted in a thicket of sandspit willow at the south end of Sirdar Lake, and near the same place on August 13 a flock of 12 females was associated with Brewer Blackbirds that fed along the margin of Duck Creek and in adjacent dry sedge marshes. One adult was collected. The only autumn record for 1948 is that of a moulting, young male still with traces of juvenile plumage about the head, collected on Nick's Island August 10.

Agelaius phoeniceus (Linnaeus). Red-winged Blackbird.

On May 13, 1948, 6 pairs of red-winged blackbirds were in occupation of a small cattail marsh that had become established in the deep water of a drainage ditch on the Reclamation. Several nests could be seen from shore and 1 of them containing 3 eggs was near enough to permit close examination. At this time other small colonies occupied similar situations but the total population was not large. The vegetation in all these small ditch-marshes was beaten down, and the bottom of the marshes silted, during the flood that followed, so that any nesting then in progress was a complete loss. The only red-winged blackbird seen later in the year was a juvenile female that accompanied a flock of Brewer blackbirds on September 10. The previous year on August 6 a flock of 12 consisting of adult females and young not fully grown, visited a thicket of sandspit willows by the shore of Sirdar Lake but were not noted after that date.

One adult male and 2 adult females collected at Creston are identified as *Agelaius phoeniceus nevadensis* Grinnell.

Icterus bullockii (Swainson). Bullock Oriole.

Mailliard (6) collected a pair of Bullock orioles on June 1, 1928, but saw no others. Twenty years later it was perhaps equally scarce as during the course of my investigation a total of only 5 individuals came under observation. The first of these was at Goat River Slough, May 22, 1947, when a richly-coloured male came close to me in the cottonwoods. Other records are of young in first-winter plumage observed feeding on mulberries on the following dates: August 16, August 21, 1947; July 29, August 2, 1948. There is no doubt that Bullock orioles breed in the Creston region as in the autumn of 1947 I found a nest lying beside the tall birch from which it had been dislodged.

Euphagus cyanocephalus (Wagler). Brewer Blackbird.

A flock of 20± feeding over an open field on May 6, 1948, was composed chiefly of mated pairs and probably represented part of the local nesting population. That this population did not suffer greatly from flood-destruction is indicated by the following comparative enumerations made after young were on the wing, viz.; August 5, 1947--50; July 31, 1948--45. Later in both years, as migrants arrived to tarry on the flats, the flocks increased in size. The tabulation below shows to what extent the numbers fluctuated.

1947		1948	
August	13-- 60	August	14--200
"	18-- 40	"	19-- 50
"	20--200	September	8--120
September	8-- 20	"	16-- 30
"	10-- 4	"	18-- 3

In the late summer of 1947 flocks of Brewer blackbirds in search of food walked along the margins of Duck Creek Channel, or waded out belly-deep in the shallows. At times they gathered on recently exposed lake bottom, particularly on the sandspit extending from the west side of Sirdar Lake--the area that caught and held so much wind-blown flotsam. A nearby willow thicket was a favourite resort between periods of feeding.

A young male taken July 31, 1948, is about half-way through the post-juvenal moult to first-winter plumage. Four remiges on either side have been renewed; across chest and along the flanks is a continuous area of fresh, irridescent plumage, this and the fresh remiges brilliant in contrast to the faded juvenile plumage that remains. A young female taken August 27, 1947, is in full first-winter plumage, differing from an adult female taken on the same day in being paler, more golden about the head.

The stomach contents of 2 specimens collected in September consisted of wheat kernels and insect debris including adult diptera, adult terrestrial coleoptera, adult _Haliptus_ sp., and larvae of this and other aquatic coleoptera.

Molothrus ater Boddaert. Cowbird.

The earliest record is May 15, 1948. On the evening of this date 2 males on the top of a tall larch were displaying before a female. Two days later a total of 12 was counted on the Kootenay Flats. None was seen later in that year but there are 3 summer records for 1947, viz.; August 4--1; August 5--2 with a flock of Brewer blackbirds feeding over a muddy beach; August 12--1 juvenal collected at Summit Creek.

The subspecies is _Molothrus ater artemisiae_ Grinnell.

Piranga ludoviciana (Wilson). Western Tanager.

A common summer visitant first seen, in 1948, on May 17. Adult males, so conspicuous in early summer, became progressively more scarce as the season advanced so that the sight of one in August was unusual. Although the presence or the absence of adult females, among the more numerous young, is difficult to detect, nevertheless there is reason to think that they too leave early--far in advance of the young that linger well into September. Late records for adult males are August 2, 1948, August 15, 1947. An adult female was collected on July 30, 1948, and only once after that date was 1 satisfactorily identified. This was on August 12, 1947, when a young bird was observed soliciting food from an adult female, presumably its parent.

The mulberry trees, referred to frequently in this report, were heavy with ripe fruit through August and September. These were a focal point for tanagers, both for the local population and for those transients that came late in August. Close by were several tall giant cedars and Douglas firs, and at times when tanagers were plentiful a movement from the mulberry trees to the cedars and back again was continual--birds on alighting in one or another of the mulberry trees would select a fruit and fly with it into a shaded recess of cedar or fir. The largest numbers counted at one time, in and about these trees, was 30 on August 12, 1948, and 20 on August 26, 1947.

Western tanagers consumed other fruits also. In Creston, August 12, 1947, 2 were feeding on the shrivelled fruits of black haw; on August 16, 1948, 2 fed on cultivated cherries, and on August 21, 1948, a flock of 5 on Sutcliffe Point were eating choke cherries. The species was last recorded on September 16, 1948.

Pheucticus malanocephalus (Swainson). Black-headed Grosbeak.

Satisfactory sight records of the black-headed grosbeak were made on the following dates, viz.; May 8, June 20, July 31, August 10, August 12, August 20, 1948, and August 26, 1947. From the spread of these dates, May to August, it perhaps may be inferred that the species nests in the region. Mailliard (6) collected a male at Creston, May 26, 1928, and notes this as the only one seen. In 1949 pairs with full-grown young were observed on August 20, and August 21, respectively. An adult male, and a young male, collected on these dates by I. McT. Cowan, are in the University of British Columbia collection.

Passerina amoena Say. Lazuli Bunting.

A male was seen and heard singing near Creston by Mr. C. Wilson on June 20, 1948. There are two sight records of young in first-winter plumage, viz.; 1 in a shrubbery on Drywash Mountain, August 5, 1948, the other in a choke cherry bush on Sutcliffe Point, August 21, 1948. A male was collected by Mailliard (6) on each of the following dates, viz.; May 19, May 20, 1928, and it is noted as a bird rarely met with--a statement that describes the present status of the species in the Creston region.

Hesperiphona vespertina Cooper. Evening Grosbeak.

Recorded in autumn only and on the following dates, viz.; September 8, 1947--5; September 18, 1948--12. Mailliard (6) collected specimens from a flock that visited Creston on May 14, 1928, and saw others, on Goat Mountain (Arrow Mountain) on May 19.

The subspecies is Hesperiphona vespertina brooksi Grinnell.

Carpodacus cassini Baird. Cassin Purple Finch.

Mailliard (6) reports this species as relatively numerous in 1928. It can hardly be described so now as individuals were seen on but four occasions. In 1948 a male in the pink plumage came under observation on May 9 as it sang from the tip of a small larch near Creston. Another singing male was observed in Creston village, May 16; a third, also in the pink plumage, was seen on Drywash Mountain, August 6. A juvenal, observed feeding on mulberries, August 21, 1947, is the only record for that year.

Spinus pinus (Wilson). Pine Siskin.

One was heard singing near Creston, May 8, 1948. The following day a pair that frequented a small larch and made flights about it came under frequent observation. A little later in the month Mr. C. Wilson saw one carrying nest material.

In the late summer of 1947 pine siskins, associated usually in large flocks, were conspicuously abundant in many types of habitat. Thus on August 29 a flock estimated to number 300 flushed from a roadside weed-patch to circle several times above the road and over an adjacent field. A portion of the flock then alighted on telephone wires to form a continuous row of birds for a distance of 30 yards or more. Finally all settled again in the weed-patch.

No flocks so large were met with in 1948, yet the species could still be described as abundant. A flock of 75±, at West Creston on September 21, was the largest number seen together that year. These birds were feeding on the seeds of giant cedar, of which an abundant crop had been produced, as were smaller flocks observed at this time.

Spinus tristis (Linnaeus). Amercian Goldfinch.

Goldfinches, seen on numerous occasions, may be described as common. Adult males, accompanying broods of young, were still in nuptial plumage so late as August 14, 1948. Early in August thistle seeds attracted them; later, in company with pine siskins they attacked cultivated sunflower seeds, and the seeds of giant cedar.

The subspecies is Spinus tristis pallidus Mearns.

Loxia curvirostra Linnaeus. Red Crossbill.

A solitary red crossbill observed on Drywash Mountain at about the 3,500 foot level on August 9, 1948, and another seen near Creston the following day, are the only records.

Pipilo maculatus Swainson. Spotted Towhee.

Brushy thickets along the margins of the Kootenay Flats, and logged-off lands at much greater elevations, were occupied from May to September by spotted towhees. Males were conspicuous on nesting territories, May 6, 1948. The earliest dates for broods out of the nest are July 29, 1948, and August 5, 1947.

In early August of 1948 the shrubberies and aspen thickets on Drywash Mountain contained several pairs and their full-grown young. Later in the month numerous others appeared and a number was collected there. The series includes young in various stages of moult, and 1 adult male. Three young collected August 17 comprise (1) a juvenile male in fresh unworn first-plumage, (2) a juvenile female in worn first-plumage with ensheathed white feathers on chest, and, (3) a young male half moulted to first-winter plumage. A young female, September 6, has completed this moult; an adult male, taken on the same date, is in full moult with rectrices 1 to 2 inches out of the sheaths, occiput shaggy with ensheathed feathers, while the tail coverts and plumage of flank and back have recently been renewed. The latest records are September 17, 1947, September 20, 1948.

The subspecies is Pipilo maculatus curtatus Grinnell. Juvenals average darker than specimens of approximately the same age from the Okanagan Valley--a condition that might be attributed to the more humid climate of the Creston region. Adults representing the two localities are indistinguishable.

Passerculus sandwichensis (Gmelin). Savannah Sparrow.

Observed on migration only and much more frequently in autumn than in spring. There is no dry grassland habitat in the Creston region and, so far as known, no savannah sparrows nest there. Two were flushed beside a road through the Reclamation on May 10, 1948, and a week later 8 were tallied near the same place.

In 1947 the first few autumn transients, 3, were noted on August 18 and on September 3 approximately 100 were flushed from roadside and wheat stubble on the Reclamation. The following day the birds were equally numerous on natural hay meadows near Leach Lake.

In 1948 the first autumn transients were recorded later and in larger number, viz.; 8 on August 25, and 15± on August 27. The migration that followed involved smaller numbers than did the migration of 1947. Thus on September 7 only 7 were flushed on the Reclamation and the following day 10 were flushed singly from a dry horsetail and sedge marsh. On September 3 some 20 birds, more closely associated than the last, searched for food along the upper portion of a beach at Sirdar Lake and when disturbed alighted in nearby willows. The latest record is of a single bird on September 23, 1948.

Four males and 4 females collected are in first-winter plumage, the skulls clear or nearly so. These are considered to be representative examples of the subspecies Passerculus sandwichensis anthinus Bonaparte.

Pooecetes gramineus (Gmelin). Vesper Sparrow.

This species is included on the basis of one sight record at Nick's Island, September 4, 1947. The bird was flushed from the roadside and there seemed to be no question of its identity.

Junco oreganus (Townsend). Oregon Junco.

Moderately common through the summer in open coniferous woods above the plain. On May 8, 1948, several males were singing on nesting territories, and on the same date in 1928 Mailliard (6) found a nest containing 5 eggs. Broods of young in juvenile plumage were observed on August 2 and August 4, 1947, and the following year several broods were met with about the edge of the burn on Drywash Mountain. Juncos became more conspicuous in September when a definite migration took place along the margins of the Kootenay Flats. Thirty at West Creston on September 20, 1948, was the largest number tallied in 1 day.

The subspecies is Junco oreganus montanus Ridgway.

Spizella passerina (Bechstein). Chipping Sparrow.

A summer visitant moderately common in various types of habitat above the valley bottom. Two pairs established on territories, the males in full song on May 8, 1948, were the first recorded in that year. Broods of young in juvenile plumage accompanied by one or both parents were seen numerous times from August 5 to August 17, 1948, beside the logging road up Drywash Mountain. Evidently these were on migration. On August 21, 22 small groups travelling along the edge of the Kootenay Flats consisted of adults and young in first-winter plumage. Two on Drywash Mountain, September 6, 1948, were the last to be recorded.

The subspecies is Spizella passerina arizonae Coues.

Zonotrichia leucophrys (Forster). White-crowned Sparrow.

There is no evidence that the white-crowned sparrow nests in the Creston region, and relatively few transients were observed there. Thus in the spring of 1948 only 5 were recorded, the first on May 8, the last on May 12. Mailliard (6) appears to have observed a somewhat similar condition. He reports that 1 was seen on May 7, 1928, and that a small migratory wave appeared during the next few days. There is the possibility that a migration of greater volume passes through in April as is so at more northern localities, for example at Okanagan Landing where the earliest and latest dates of first arrival in 24 years are April 6, 1916, and April 28, 1921, and at Lac la Hache where the species became common April 30, 1943 (9).

The southern movement is of small proportion, the precise data for 1948 being: September 6--3; September 11--4; September 16--6; September 18--2; September 23--4. All those observed were young in first-winter plumage.

The subspecies is Zonotrichia leucophrys gambelii (Nuttall).

Passerella iliaca (Merrem). Fox Sparrow.

Mailliard (6) records the species on the basis of 1 bird heard near Creston, May 9, and another that was shot but not recovered on May 16, 1928. These are the only records.

In the interior of British Columbia fox sparrows migrate at high altitudes and only rarely is one seen in the lowlands.

Melospiza lincolni (Audubon). Lincoln Sparrow.

On August 21, 1949, a single individual of this species was flushed several times from a rhododendron thicket in Boundary Valley. This is the only record.

Melospiza melodia (Wilson). Song Sparrow.

Common in a habitat of brushy thickets along the margin of the Kootenay Flats where males, established on territories, were singing on May 7, 1947. As elsewhere the nesting season is a long one and probably involves the raising of several broods. In 1948 territorial males sang as late as July 29, and in 1947 adults were observed carrying food to young as late as August 15.

The subspecies is Melospiza melodia merrilli Brewster.

TABLE NO. 1

Migration of some common land birds at Creston

	First seen 1928	First seen 1947	First seen 1948	Last seen 1948
Nighthawk				Sept. 5
Vaux Swift		May 14	May 17	
Black-chinned Hummingbird	May 14			
Rusous Hummingbird			May 15	August 23
Calliope Hummingbird	May 14		May 20	
Lewis Woodpecker		May 21	May 15	
Eastern Kingbird	May 12	May 21	May 17	August 26
Western Kingbird	May 10	May 17	May 17	
Hammond Flycatcher	May 17		May 9	August 22
Wright Flycatcher	May 17			
Western Woodpewee	May 28			Sept. 7
Rough-winged Swallow	May 6		May 10	
Barn Swallow	May 10	May 14	May 8	Sept. 22
Catbird	May 8		May 23	August 23
House Wren			May 14	Sept. 6
Swainson Thrush	May 31		May 19	August 12
Ruby-crowned Kinglet	May 3	May 11	May 6	Sept. 24
Solitary Vireo	May 3		May 9	
Red-eyed Vireo	May 24		May 20	August 23
Warbling Vireo	May 25		May 21	August 22
Nashville Warbler	May 3		May 8	August 17
Yellow Warbler	May 4	May 18	May 15	August 21
Audubon Warbler	May 6		May 7	Sept. 24
Yellow-throat			May 17	Sept. 13
American Redstart	May 28		May 19	August 24
Bobolink	May 28		May 24	August 10
Bullock Oriole	June 1		May 22	
Cowbird	June 1	May 14	May 15	
Western Tanager	May 15	May 14	May 7	Sept. 16
Black-headed Grosbeak	May 28		May 7	August 26
Savannah Sparrow	May 2		May 9	Sept. 23
Chipping Sparrow		May 11	May 7	Sept. 6
White-crowned Sparrow	May 7		May 7	Sept. 20

Records for 1928 are those of Mailliard (6).

THE MAMMALS

Over the greater part of British Columbia the trapping of fur-bearing animals is carried on under a system of trap-line registration, and, as trappers are obliged to submit an annual return of the catch, there is available a mass of statistics useful to the biologist. Most of the information concerning fur-bearing animals submitted in this paper was derived from this source. Included also are the Mailliard records of small mammals, representing 9 species taken at Creston (6) and those of Laing (ms.), representing 13 species. My trapping was of necessity a spare-time activity that resulted in the preservation of 42 specimens of 13 species.

Sorex vagrans Baird. Wandering Shrew.

This shrew was trapped in a variety of habitats including Microtus runways on the Kootenay Flats, a dry situation in lodgepole pine forest, and along a stream margin in moist woods where bracken and thimbleberry grow. The average measurements of 4 adults are: 106 (103-109); 47.5 (45-50); 12.7 (12-13).

The subspecies is identified as Sorex vagrans monticola (Merriam).

Sorex obscurus Merriam. Dusky Shrew.

An adult male dusky shrew was trapped in a Microtus runway on the Kootenay Flats, May 15, 1948. The specimen measured 115, 45, 15.

The subspecies is identified as Sorex obscurus obscurus Merriam.

Sorex palustris Richardson. Water Shrew.

A water shrew taken September 9, 1948, on the margin of Drywash Creek, in the lower part of Drywash Canyon, at approximately 1,900 feet altitude, is the only record.

The subspecies is Sorex palustris navigator Baird.

Myotis yumanensis (H. Allen). Mouse-eared Bat.

A series of adult females and young of both sexes, collected at West Creston, August, 1929, is in the National Museum of Canada. These specimens were collected in the attic of an unused house, built on a rocky promentory that extends on to the Kootenay Flats from the mountain base on the west side of the valley. The house, famous in local annals for the bat colony it harboured, has long since been torn down.

The subspecies is identified as *Myotis yumanensis sociabilis* H. W. Grinnell.

Lasionycteris noctivagans (Le Conte). Silver-haired Bat.

A specimen of this bat was found dead near Creston on September 15, 1948. It was not preserved.

Corynorhinus rafinesquii (Lesson). Lump-nosed Bat.

One taken at West Creston, August 12, 1929, in the house referred to above, is in the National Museum of Canada collection.

The subspecies is identified as *Corynorhinus rafinesquii pallescens* Miller.

Procyon lotor (Linnaeus). Racoon.

In the winter of 1942-43 Mr. A. Arnstead trapped a racoon on the Kootenay Flats near Wynndel. Mr. Arnstead told me that the animal was large, well furred, and sold for the top list price. It showed no sign of having been in captivity, nevertheless this possibility is to be considered and the record is included for what it may be worth.

Euarctos americanus Pallas. Black Bear.

Black bears are perhaps currently less common in the Creston region than they are in many other settled parts of the Province. In September, 1948, I examined great quantities of fecal deposits under several old apple trees beside an abandoned settler's cabin at Leach Lake. The amounts and condition of the deposits suggested that several bears, perhaps a family, had been feeding on an abundant apple crop for several nights past. At this time it was reported that a bear was raiding an apple orchard near Wynndel. At West Creston I found the skeleton, with some hide attached, of an old male, medium brown in colour, that had been shot probably a year earlier.

Ursus horribilis Ord. Grizzly Bear.

A few grizzly bears are reported to frequent the mountain ranges east of Kootenay Lake, and occasionally one of the animals, or evidence in the form of tracks, is seen on lower slopes. I examined the mounted head of one that was shot near the south end of Kootenay Lake in 1945. A statement, made to me by an old Indian, Tommy Swanson, that a grizzly was living on the Indian Reserve south of Creston, may have been true, but the evidence was not seen.

Vulpes fulva (Desmarest). Red Fox.

Reported to be scarce, and fur-records show that not more than 1 or 2 are taken annually. I examined the skin of an animal trapped about 5 miles east of Wynndel, at an altitude of approximately 4,000 feet, in the winter of 1947-48.

Canis latrans Say. Coyote.

One was seen, August 15, 1947, on an open beach at the south end of Kootenay Lake. Fresh tracks, in the muddy shore of Summit Creek, were noted occasionally and on 2 days in August, 1947, a chorus of voices came from the cottonwoods on the Kootenay Flats. Four specimens shot by Game Warden Lines in the winter of 1947-48 were badly infected with mange. The coyote can be described as currently less than common in the Creston region.

Martes americana Turton. Marten.

The marten population, at least on 2 sections of the Nelson Range where local trappers operate, would seem to be maintaining its numbers. On a trap-line up Boundary Creek, near the International Boundary, the trapping returns for the past 4 seasons are: 1944-45--12; 1945-46--7; 1946-47--13; 1947-48--17. The last represents the largest catch on the line since 1930. The second line, situated in the district west of the south end of Kootenay Lake, is trapped less regularly; the most recent return covers the season of 1944-45 when 12 marten were taken.

Mustela erminea Linnaeus. Short-tailed Weasel.

This is the common weasel of the lowlands and can be assumed to represent the greater part of the annual catch. Arnstead's trap-line on the Kootenay Flats produced a yearly average of 58.5

weasels over the period 1929-30 to 1947-48. The largest catches reported were 100 in each of the seasons 1929-30, 1930-31, 1936-37; the smallest catch, 31, was taken in 1946-47.

The subspecies, determined from summer specimens in the National Museum of Canada, is Mustela ermineae invicta Hall.

Mustela frenata Lichtenstein. Long-tailed Weasel.

A momentary glimpse of a weasel with yellow underparts, on Drywash Mountain, August 9, 1948, was the only observation of the species. Large weasels taken in the mountains, and reported by local trappers, probably are of this species.

Mustela vison Schreber. Mink.

Mr. A. Arnstead trapped a total of 75 mink on the Kootenay Flats during the period 1929-30 to 1947-48. The largest yearly catches were 11 in 1941-42, and 10 in 1947-48.

Mephitis mephitis (Schreber). Striped Skunk.

This is a common animal, it forages along the margins of the Kootenay Flats, invading these lowlands during periods of low water. Here in August and September, 1947, fresh tracks and droppings were plentiful in the mud of channel margins. I examined 3 adults shot by local farmers in the summer of 1948, and on August 25 of that year 1, about a third grown, crossed the road in front of my car. In the winter of 1947-48 a trapper took 23 along the Goat River.

Felis concolor (Linnaeus). Cougar.

Reported to be uncommon. One was shot about 4 miles east of Creston in February, 1948.

Lynx canadensis Kerr. Canada Lynx.

Trappers on the Nelson Range occasionally capture a lynx; the largest return is 4 trapped during the season of 1943-44.

Lynx rufus (Schreber). Bob-cat.

During a 10-year period, 1936 to 1946, 10 were trapped by

Mr. A. Arnstead in the mountains east of Wynndel, others are reported from the west side of the Kootenay Flats.

A specimen in my possession taken at Gray Creek, 50 miles north of Creston, is identified as Lynx rufus pallescens Merriam.

Lepus americanus Erxleben. Varying Hare.

Varying hares were very scarce in 1947, so much so that no sign of their presence was detected anywhere. This scarcity was apparent again in 1948, although I did see one animal on Drywash Mountain. The same condition apparently prevailed in 1928 when Mailliard took but one.

This specimen, apparently collected near Creston, on the east side of the Kootenay River, is reported to be intermediate in character between Lepus bairdi bairdi (Lepus americanus bairdii Hayden) and Lepus bairdi cascadensis (Lepus americanus cascadensis Nelson) (6). Three specimens in the National Museum of Canada, collected on the west side of the Kootenay Valley near West Creston, are designated as Lepus americanus pineus Dalquest, with the notation that 2 show intergradation with Lepus americanus columbiensis Rhoads (1).

Marmota monax (Linnaeus). Woodchuck.

A single specimen taken by Mailliard (6) is the only record. A search for burrows in suitable habitat was unrewarded; the animal is unknown to the local residents who were questioned, but its presence could easily escape notice.

The subspecies is Marmota monax petrensis Howell.

Citellus columbianus (Ord). Columbian Ground Squirrel.

During May Columbian ground squirrels were observed on lower mountain slopes and on the Kootenay Flats--both the primitive and the dyked portions. All had gone into hibernation by the first week in August. It was not abundant and it was exceptional to see more than 2 or 3 during a day's travel. One exception was a colony on the Indian Reserve south of Creston, visited May 18, 1948. Here some 10 to 15 adults were distributed over about 5 acres of land at an elevation slightly above the high-water mark normally reached by the spring flood. In 1948 this territory was inundated to a depth of at least 14 inches, so it may be assumed that many or all the animals drowned.

Citellus lateralis (Say). Mantled Ground Squirrel.

Occupying much the same territory but less common than the last. August 26, 1947, was the latest date on which the species was recorded but undoubtedly it is active much later, as is so elsewhere.

Eutamias amoenus (Allen). Chipmunk.

This is the chipmunk of the mountain slopes on the east side of the valley, and on lower elevations on the west side where it occupies territory also inhabited by Eutamias ruficaudus. Seven specimens were taken at various elevations above the plain. A female collected in second growth coniferous woods on May 19, 1948, carried 4 small embryos.

Dr. R. E. Orr recently examined the chipmunks taken by Mailliard at Creston that are in the California Academy of Sciences collection, and refers them to this species; they are not Eutamias ruficaudus as reported (6).

The subspecies is nearest to Eutamias amoenus luteiventris (Allen).

Eutamias ruficaudus Howell. Chipmunk.

This was the only chipmunk found in Boundary Creek Valley. It occurs also in the Kootenay River Valley and the slopes on the western side. It was not found on the mountain slopes on the eastern side. The particulars of 2 specimens collected are: male, adult, September 15, 1948--245, 115, 33; female, young, August 25, 1947--232, 109, 33.

The subspecies is Eutamias ruficaudus simulans Howell.

Tamiasciurus hudsonicus Erxleben. Red Squirrel.

Common in suitable habitat throughout the region--in spite of the fact that large numbers are shot annually for the fur trade.

The subspecies is Sciurus hudsonicus richardsonii (Bachman).

Glaucomys sabrinus (Shaw). Flying Squirrel.

No flying squirrels were trapped although sets were made in suitable places. Probably the species was more plentiful in 1929 when a series of 9 was taken for the National Museum of Canada. These are identified, by Anderson, (1) as the subspecies Glaucomys sabrinus fuliginosus (Rhoads).

Thomomys talpoides (Richardson). Pocket Gopher.

The species is common locally and represented by 2 well-marked subspecies whose ranges are separated by the barrier of the Kootenay River.

One population on the east side of the River occupies about 2 square miles of cultivated bench lands at an approximate altitude of 2,000 to 2,500 feet. A second smaller population is established in a clearing on a shoulder of Goat Mountain at an elevation of 3,000± feet altitude. The soil at each place is a fine, reddish loam. No evidence of the presence of pocket gophers was detected on the east side of the Kootenay River at any other place. This seems remarkable as both to the north and to the south of the larger colonized territory are areas of identical habitat with the same soil-type. To the west is the barrier of the Kootenay River. Neither do the mountain slopes to the east appear to be occupied although it may be presumed that by this mountain route the animals reached their present location. Presumably also the colony is now an isolated one. The nearest point east of the Kootenay River where specimens have been taken is Goatfel, 17 miles to the east across the Moyie River.

Adults from this colony, collected in May and September, differ from all the other forms of British Columbia examples of Thomomys talpoides examined in the larger amount of white on the silvery grey underparts; none has a buffy wash on this surface. The average measurements of 7 adult and sub-adult males are: 213.28 (206-220), 77.43 (72-82), 27.3 (24-29). The average measurements of 5 adult and sub-adult females are: 205.20 (200-210), 72.20 (73-74), 26.60 (23-29). These are believed to represent an undescribed subspecies.

The population on the west side of the Kootenay River is widely dispersed. Colonies are established 100 feet and less above the plain, on old logging roads through the forest, and on cultivated bench-lands. One isolated colony was observed in Boundary Creek Valley at 4,000± feet altitude. In general the soil-type is an ochre-coloured loam, but in the Corn Creek bottom, and in the small area occupied in Boundary Creek Valley, the soil is black loam, rich in humus.

A series of 13 adult specimens average smaller than the last, and the skulls are more slender; the pelage is paler above and darker below. The underparts, strongly tinged with buff, are without white markings. Average measurements of 7 adult and sub-adult males are: 208 (197-212), 69.59 (63-82), 24 (23-25). Average measurements of 6 adult and sub-adult females are 201.16 (200-218), 69.50 (67-73), 24.50 (23-26).

The race is identified provisionally as *T. t. medius* Goldman.

Castor canadensis Kuhl. Beaver.

A small number of beaver inhabit the Goat River near Creston and from this population several are taken each year by a local trapper. Fresh beaver sign was observed along the Kootenay River in 1947, and here, too, an occasional animal is trapped.

Peromyscus maniculatus (Wagner). White-footed Mouse.

White-footed mice were trapped in various types of habitat, including the wooded margin of reclaimed lands. In 1948, 10 adults and sub-adults, and 3 young, were captured in 100 trap nights.

The 3 adults preserved are darker, and average slightly larger, than the average of the 6 largest in a series of 20 adult *P. m. artemisiae* from Okanagan Landing, the respective measurements being: Creston specimens 177.7 (168-195), 90 (86-95), 21 (21-21); Okanagan Landing specimens 174.5 (164-182), 86 (81-89), 21.5 (20-23).

Neotoma cinerea (Ord). Bushy-tailed Wood Rat.

The one specimen taken, Drywash Canyon, September 6, 1948, is identified as *Neotoma cinerea occidentalis* (Baird).

Clethrionomys gapperi (Vigors). Red-backed Mouse.

Several areas of open, conifer forest, margins of woodland streams, and other habitat types favoured by *Clethrionomys* elsewhere in British Columbia, were trapped with little success--only one specimen being captured in 80 trap-nights.

None was taken by Mailliard; the specimen referred to by him (6) is from Kitchener, a locality outside the region considered in the present paper. Neither did the National Museum of Canada expedition find this vole at West Creston. The species then can be considered rare in the Creston region.

The subspecies represented is Clethrionomys gapperi saturatus (Rhoads).

Microtus pennsylvanicus (Ord). Meadow Mouse.

Microtus runways through weeds, grass, and under logs, on a high levee at Wynndel, and through grass patches alongside a drainage ditch on the flats at Sutcliffe Point produced a total of 9 specimens in 57 trap-nights, May 11 to 14, 1948. Of these 3 were adults and 6 were young, averaging 100 millimetres in total length. Several weeks later these colonies were flooded out.

September trapping in a different type of habitat, viz.; small carex patches alongside a road through cedar and hemlock 600 feet higher than the plains produced 2 sub-adults in 80 trap-nights.

Average measurements of 3 adults are: 162.7 (156-172), 52.7 (48-56), 20.3 (19-21).

Dr. R. E. Orr has informed me that the Microtus taken by Mailliard at Creston are pennsylvanicus not mordax (longicauda) as reported.

The subspecies is Microtus pennsylvanicus modestus (Baird).

Ondatra zibethica (Linnaeus). Muskrat.

Although much muskrat habitat on the Kootenay Flats has been destroyed by reclamation this animal still provides a substantial part of the revenue enjoyed by local trappers.

The dyking of about 8,000 acres in 1936 eliminated some of the best habitat, one on which a trapper took 1,420 animals during the 4-year period 1931-34. An area of similar size elsewhere on the flats produced only 526 muskrats during this period. This last area, trapped by Mr. Arne Arnstead, produced a total of 2,229 muskrats during the period between 1930 and 1948, the highest catch being 200 in 1930, the lowest 31 in 1945.

On the Kootenay Flats muskrats are chiefly shore-dwellers rearing young in dens made in wooded banks along the margins of the flood plain. Usually the entrance is below the minimum springtime water level. Houses of small size are built about marshes and ponds during September and October and invariably no vestige of them remains after the spring flood. Two examined on May 10, 1948, were built of sedges, two others of cattails, all being re-inforced with mud.

Local trappers identify the mink as the chief predator on muskrats.

Erethizon dorsatum (Linnaeus). Porcupine.

Signs of porcupine work in an apple orchard near Sirdar were noted in September, 1948; the animal apparently is locally scarce and none was seen.

On geographical grounds the subspecies is identified as *Erethizon dorsatum nigrescens* Allen.

Cervus canadensis (Erxleben). Wapiti.

An occasional wapiti enters the district probably from the east Kootenay region where the species is relatively abundant. It is known that a female was killed on the Kootenay Flats near Wynndel in the winter of 1946-47, and 2 animals were seen by several local residents about September 5, 1947, at a place 5 miles south of Creston.

Odocoileus hemionus (Rafinesque). Mule Deer.

A relatively small mule deer population spends the summer months on the mountain slopes, frequenting old burns and logged-off areas. Occasionally one descends to lower altitudes as on May 27, 1948, when a female was seen alongside the road near Wynndel. Nothing was learned concerning the species' winter range.

Odocoileus virginianus (Boddaert). White-tailed Deer.

This is the common deer of the region and there is much evidence that a substantial increase in numbers has taken place during the past 20 years.

In that time a great extension of habitat suited to the needs of the species has developed as a result of logging and fires and the replacement of conifers by deciduous growth that followed. The increase of acreage under cultivation is another factor that operated in the interests of the species. Tree-fruit growers have suffered serious loss through destruction of young trees by white-tailed deer and, in dealing with this problem, it has been necessary for Provincial authorities to authorize by permit the killing of deer in orchards.

The lower mountain slopes are both summer and winter range, and the meadows on the Kootenay Flats are an important summer range. Here animals were frequently seen during August and September, and many places where deer had bedded in the horsetail marshes were examined.

Alces americana (Clinton). Moose.

Moose are occasionally seen on the Kootenay Flats, as for example on September 12, 1947, when a section foreman on the Canadian Pacific Railway reported sighting a bull and a cow near Kootenay Landing. It seems likely that, as with the wapiti, these animals are visitors from the east Kootenay region.

Rangifer arcticus (Richardson). Mountain Caribou.

It is known that a small population of caribou inhabits plateau country on the Nelson Range to the west, and another the Moyie Range to the east of the Kootenay Valley. There are several reports also, of single caribou on the Kootenay Flats; presumably these animals were crossing from one range to another.

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